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THE COPPER HANDBOOK

**A MANUAL OF THE COPPER INDUSTRY OF
THE WORLD**

VOL. VI

**COMPILED AND PUBLISHED BY
HORACE J. STEVENS
HOUGHTON, MICH., U. S. A.
1906**

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Following the text of the book is an advertising section, carrying the announcements and cards of manufacturers, dealers in mining supplies, mining companies, engineers, metallurgists, chemists, trade journals, railroads, etc.

PREFACE.

In explanation of the late appearance of the present issue of the Copper Handbook, which is the sixth annual edition, the author must plead a considerable loss of time, in the early months of the year, from sickness that caused entire cessation of work and absence from home for some little time. This loss of time is responsible for the omission of sundry features of interest that it was hoped to incorporate in the present edition. Plans have been laid, not only for the next edition, but for the second issue to follow, and it is hoped, by reason of the long look thus taken ahead, that similar annoying delays will not be experienced hereafter, and that the 1907 edition may be issued promptly.

The preliminary chapters of the present edition of the work will be found but slightly changed, which is to be regretted, but was unavoidable, unless one annual edition were lost, hence the appearance of the preliminary chapters with scant revision, as the lesser of two evils. The two final chapters have been entirely rewritten, however, with care, and as a consequence about one thousand new titles have been added, and the fifteenth chapter, devoted to detailed mine descriptions, is one-third longer than in the preceding issue. About the only descriptions unchanged are those pertaining to defunct or moribund corporations, which are dismissed in a line or two. Efforts have been made to verify the information given, and while errors will be found, it can be said, as in previous editions, that for every statement of fact contained in this vol-

ume, corroborative evidence of some sort can be furnished. The conclusions given regarding the various properties are personal opinions, but the statements of fact are as unbiased and colorless as it has been possible to make them.

As in previous editions, the author wishes to disclaim all pretensions to infallibility, and will welcome criticisms and corrections from any source. This invitation has been responded to generously, in the past, and much of the credit for whatever accuracy and completeness the book may possess is due to hundreds of mining men and others, in all parts of the globe, who have kindly given suggestions, corrected errors and furnished data regarding various copper properties. The responsible heads of the various departments of the larger copper producers have responded more fully and in larger numbers than ever before, and a large part of the information contained in the work may be considered, therefore, of a semi-official nature. It has taken time to convince the busy men of affairs, at the head of the great copper enterprises of the world, that the Copper Handbook is meant for a strictly legitimate expositor of the industry, but this happy result seems to have been accomplished, at last. Whatever the errors of the book, they are not errors of intent, and there is ample room in the world for work that is done honestly, and with a fair degree of intelligence. It is not to be wondered at that time has been required to establish confidence in the work, among the men who mine and smelt the copper, for it is true, unfortunately, that the ease with which type may be put to paper has bred, in every country, parasites to the mining and financial press, and in addition to the honest and worthy periodicals and annuals in these fields, there are publications, ostensibly designed along the same lines, that actually are conducted mainly for blackmailing purposes.

The work of preparing the Copper Handbook is made more arduous for the author, but easier for the reader, but the system followed, which calls practically for writing all matter twice over. By this plan all new material secured and verified, and old material from the previous edition considered worthy of retention, is carefully assorted, in the form of full notes, under twenty-one main heads, and, in the case of important mines, the various titles are subdivided minutely, and from the material so gathered, and put in order, the new descrip-

tion is written. This guards against repetition, assures the giving of all matter in logical sequence, and is a great saving in space, which means, in the end, a corresponding saving in time to the reader. For the present edition, about one hundred thousand notes were made for the fifteenth chapter.

The mining bureaus of a great majority of the governments of the world have manifested a friendly interest in this work, and have responded cheerfully to the considerable calls upon their time involved in answering numerous inquiries. The officials of mining companies and numerous independent engineers have answered questions readily, and in such a manner as to add greatly to the value of the material secured. In fact there have been but a few instances where information of any sort has been refused, in the case of mining companies actually engaged in the production of the metal.

The work of attempting to pass upon the prospects, financial probity and technical ability of a vast number of mining companies, located in all parts of the world, is a task of no small size. The work has been done with a view solely to justice, and it is a source of self-gratulation that of the many companies condemned as unworthy, in the last annual edition, not one has been considered entitled to an apology in the present issue, while of the many corporations commended last year, only one is condemned in this issue, and in the case of this company, a change for the worse, from a former upright policy, is responsible for the change of rating.

Two years ago the Copper Handbook gave a good rating to the American Mining, Milling & Smelting Co., but this was reversed last year, with an explanation of the circumstances, and it was stated in the article describing the concern, that "every man connected with this company is either a fool or a rascal," and the names of the officers of the company, as reported, were given in quotation marks. It is a source of satisfaction to the author to be able to state, that, partly through his efforts, the swindlers running this company are, at this writing, in jail, in London, awaiting trial, and the "officers" of the company, whose names were given in quotation marks, have not been located

verifying the suspicion before entertained that they were entirely mythical personages.

Much of the financial advertising for mining companies carried by the daily and financial press, and by alleged mining journals, is of a fraudulent nature, but the Copper Handbook has helped to put a few of these swindlers out of business, and hopes to take a few more scalps in the future. This work sometimes necessitates attacking people in high places, and may cause the addition of a somewhat sensational chapter to the next edition of the book, unless the United States Postal Department, which is doing good work in cleaning out the smaller thieves, can be brought to take action in the case of the big swindlers also.

In the advertising section at the rear of the text of this work will be found a large number of advertisements, for which the consideration of the reader is requested. Great care has been exercised in censoring all advertising about which there could be any question, and a number of advertisements proffered have been rejected. It has been thought best, in this edition, not to accept the advertisement of any mining company not an actual producer of copper.

HORACE J. STEVENS.

Houghton, Mich., U. S. A., Sept. 15, 1906

THE COPPER HANDBOOK

CHAPTER I.

THE HISTORY OF COPPER.

The discovery and utilization of copper occurred at a period so remote that even legendary accounts are lacking. A semi-authentic narration of the facts connected with the discovery of iron on Mount Ida has been handed down to us, yet there were copper mines worked on this same mountain in Asia Minor before the alleged date of the discovery of iron. The earlier history of the useful metal is surrounded by the same myths as cloud the story of mankind in general in days so far remote. There seems good reason to think that copper and tin, in the form of bronze, an alloy of these two metals, was in general use before the discovery of the process of producing iron from its ores. Such was unquestionably the case with the primitive peoples of Northern and Western Europe. In Asia Minor, the scene of the earliest civilization known to archaeologists, many weapons, implements and ornaments of bronze have been found in buried cities of seven to eight thousand years of age. On the American continent the aboriginal peoples were unacquainted with the use of iron, but the richer and more advanced nations had great stores of copper, gold and silver. The latter metals, found in profusion in Mexico and Peru, were utilized mainly for ornaments and decorative architecture. There being no important tin deposits as yet developed in the new world, and there being no evidence that tin was mined on the North and South American continents before their discovery by Europeans, it seems altogether probable that the aboriginal American races were totally unacquainted with bronze and brass. However, copper itself was used extensively. It was mined from Lake Superior deposits of native metal in very considerable quantities, and was distributed at least as far south as Mexico, and to practically all parts of the territory now constituting the United States. The date at which this mining was done is variously estimated at some hundreds to many thousands of years ago. The Chippewa Indians were in possession of the southern shore of Lake Superior when it was visited by the first white explorers, the intrepid Jesuit missionaries, Rene Menard and Claude Allouez, early in the Seventeenth century; Father Menard, the first white man to set foot on the shore of the

great fresh water sea, having lost his life a few miles from where the greatest copper mines of Lake Superior are now developed. The Chippewas were then unacquainted with any of the practical uses of copper, though possessing a few small masses of the native metal, saved apparently for the same reason that impels a child to collect bright colored bits of broken glass. The Indians not only made no practical use of copper, but were unacquainted with the use of any other metal. As extensive mining operations were formerly carried on in the district held by the Chippewas in the middle of the Seventeenth century, the last actual mining must have been done at least several hundred years earlier, or some oral traditions would have been handed down. Whether the mining was done by ancestors of the aboriginal tribes discovered in possession of the Lake district by the earliest white explorers, or by some antecedent people of higher civilization, is a point that archaeologists and ethnologists are still arguing. Whatever may have been the derivation or fate of that pre-historic race of copper miners, vaguely termed "Mound Builders," it is certain that they enjoyed at least a rudimentary civilization, and were successful metallurgists, for they possessed the art of tempering copper. Weapons for the chase and war and domestic utensils of good finish and style, and highly tempered, are dug from mounds and found in sand dunes along the southern shore of Lake Superior from time to time. In this connection, it may be observed that many zealous metallurgists, mostly of the amateur stripe, are wasting much time in efforts to re-discover the "lost art" of tempering copper. Sundry fairly successful processes for tempering copper are now known to scientists, but the art, even if again brought to its pristine perfection, would be of no great benefit, as steel and iron are much cheaper than copper, and far preferable for any ordinary use to which tempered copper could be put.

From the earliest dawn of history, copper and gold seem to have been in common use among the more civilized nations, the yellow metal for ornaments and as a medium of exchange, and the ruddier one for weapons and implements, usually in the form of an alloy, as brass or bronze. The ancient world of Grecian and Roman days possessed considerable stores of copper, and mines were regularly worked. There are apparently good reasons for believing that the Phoenicians knew of the tin and copper deposits of Britain at a period as remote as 1,000 B. C. Spain was the source of the principal copper supplies of the Roman empire, although other fields were also worked to some extent. Spain has been furnishing copper to the world for nearly three thousand years, and remains one of the principal sources of the world's copper supply.

During the dark period of the middle ages, mining, while not a lost art, was certainly not followed as systematically and successfully as during the more prosperous and enlightened era of Roman dominion. The world's supply of gold and silver decreased from century to century, owing to the losses from attrition and misplacement not being made good by the quantities mined. Iron, being subject to rust, was mined and smelted as required, although the production was surprisingly small. It is probable that the

United States Steel Corporation now turns out in every working day more iron than was produced in all Europe in a full year, at the period of greatest darkness during mediæval times. The supply of copper during the middle ages must have been very small, but the science of statistics was not then in vogue, in a period when a king was called *Beauclerc*—good clerk—because he could write his own name without the guiding hand of a monk.

When Europe awoke from the lethargy and sodden life of the dark ages, in the Fifteenth century, the use of the metals began growing, and this growth has continued, with few interruptions, to the present day. The tin and copper mines of Cornwall became sources of great wealth to their titled owners, and the mining of copper was stimulated in Germany, Norway and other European countries. In the Eighteenth century copper mining was started in the American colonies of Vermont and New Jersey. In the Sixteenth century copper was discovered in Mexico and several parts of South America, but the Spanish conquistadors were more anxious for the gold of the Peruvian Incas, and the silver from San Louis Potosi, than for the cheaper metals.

At the beginning of the Eighteenth century the English mines, in Cornwall, were making much the largest part of the world's copper, and even at that date were of such considerable depth and with such extensive underground openings that the problem of disposing of the water was of the most vital importance. Many good mines were allowed to remain idle, solely because the expense of keeping them free of water was greater than the profits of operation. The first steam engine was built for a Cornish mine, the *Wheal Por*, by a Captain Savery, very early in the Eighteenth century. It was but a partial success, and the plan was improved on by Newcomen, who erected a pumping engine at the *Wheal Fortune* mine, Cornwall, in 1720. The Newcomen steam engine was a crude and wasteful device, according to the standard of the present day, but it was much more effective than hand and horse power, or a water wheel, and was used in many of the larger Cornish mines for fifty years or more, until the genius of Watt brought forth the modern steam engine—an engine that a century and a quarter has been unable to improve upon in essential plan, though many and great betterments have been made in details. It should be said, however, for Savery and Newcomen, that crude as were their steam engines, the pumping plan followed by them was essentially sound, and the Cornish pump, first made by Savery nearly two hundred years ago, and improved a little later by Newcomen, is still the basic model for the Cornish mine pumps, scattered over the habitable world, wherever there are mines.

The first Watts engine was erected at *Chacewater*, Cornwall, in 1777, and proved a great success. It came none too soon, as the larger mines, deepened by reason of the aid given from Newcomen's pumps, were at a depth where the first crude engines could no longer give satisfactory results.

Although steam power was first applied to copper mining nearly two centuries ago, it was used only for handling water until after the beginning of the Nineteenth century. The first application of steam power to

other mining uses was in the first or second decade of the Nineteenth century, when a hoisting drum was first actuated by steam.

At the beginning of the Eighteenth century Great Britain was making at least three-quarters of the world's copper. The Cornish mines produced 4,923 tons of refined copper in 1799, and the Welsh mines of Anglesea made nearly 2,000 tons in the same year. The great Mansfeld mine, in Germany, made only 372 tons in that year, and only estimates are obtainable for the products of other countries. Spain's output was insignificant, and the United States made but a few tons. Russia and Japan probably ranked next in importance after England as producers, and Austria, Norway, Sweden, Italy and several other nations made small contributions to the world's copper stock. Australia, South Africa and Canada were then unknown as sources of copper supply. It is a notable fact that one hundred years ago, the mines of the United States, Spain, Chile, Mexico, Canada, South Africa, Australia and Tasmania, which now make about 90 per cent. of the world's copper, were either totally undeveloped, or else producers of but a few tons each, while Great Britain, which made almost 7,000 tons of copper in 1799, produced but 550 tons in 1899.

For the first half of the Nineteenth century, Great Britain maintained its position at the head of the world's copper producers, but the latter half of the century was a period of ever increasing depression, relieved by only occasional years of prosperity for the British copper mines. The invention of the Watts engine and its application to pumping machinery enabled the mine operators of Cornwall and Anglesea to penetrate to depths theretofore undreamed of. In 1790 the Dolcoath mine in Cornwall was 600 feet deep; in 1816 it was down 1,368 feet, and in 1830 the Tresavean mine, also of Cornwall, reached the great depth of 1,920 feet. As the mines increased in depth rapidly, various improvements became necessary. The old method of raising ore in baskets carried up ladders on the backs of men and women was replaced by whims, operated first by hand, then by horse power, later by water wheels, and eventually by steam. Around these whims were coiled the ropes that hoisted ore in wicker baskets. A little later the hempen ropes were replaced by wire cables, and the baskets gave way to iron skips and cages. In 1842 the first man engine was built, for taking men to and from their work in the deep mines. Mine surveying was introduced, and machinery employed in the mills, where hand work had been the rule for centuries. The Anglesea mines enjoyed great prosperity for the first quarter of the century, but gave unmistakable signs of exhaustion a few years later, and in the fourth decade ceased to be important factors in the world's copper industry. The smelters of Wales had attained such growth, however, that Swansea still remains the seat of one of the greatest and most diversified smelting industries of the world.

It was in the fourth decade of the last century that the competitors destined to destroy the English copper mining industry first began coming to notice. The copper discoveries in the Lake Superior district were made at about the same time as copper in workable quantities was found

in Australia, but the Australian mines were of slow development, and have never grown to be of great importance, while the Lake Superior mines soon became the largest of the world. The first actual copper mining at Lake Superior was done in 1844, and the first product secured was a few tons of oxide ore—not native copper—taken from a fissure vein near Copper Harbor, Keweenaw county, by the Pittsburg & Lake Superior Mining Company, which later developed the Cliff mine, nearly twenty miles to the southwest. The Minnesota mine in Ontonagon county was opened shortly after, and since that time the Lake Superior copper industry has enjoyed a large and fairly steady growth.

Beginning in the early fifties, the Chilean copper deposits were systematically developed and Chile has become one of the world's greatest producers. The Tharsis mine in Spain, was re-opened in 1863. It was in the sixties that the competition of cheaper copper from richer mines first began to be felt most severely in Cornwall, resulting in the closing of one mine after another, until today, the Cornish mines in active operation are few in number and their profits trivial.

The awakening of Japan by Commodore Perry in 1854 was succeeded by a period of angry contempt for foreign manners and methods on the part of the Japanese, but this was followed by the revolution wherein the shogun was deposed and the mikado became the actual instead of the merely nominal ruler of the island empire. The introduction of foreign methods has been followed by the industrial awakening of Japan, and the Japanese mines are now sources of copper supply of great importance, and even greater promise.

In 1866 the Calumet & Hecla was opened and speedily took first rank among the copper mines of the world. In 1876 the great Rio Tinto mines of Spain were reopened, after a century of idleness. The Moonta and Wallaroo mines were opened in Australia at about the same time as the Calumet & Hecla, and Tasmanian copper deposits first attracted attention in the same decade, though no considerable production was secured until nearly twenty years later.

In 1880 the Butte camp of Montana, now the greatest copper producer of any district in the world, was discovered. Butte was originally a placer gold camp, and the first Butte copper mine, the Anaconda, was opened for silver, and eventually became the largest copper producer of any of the world's mines. In the latter eighties, South Africa developed several good mines; the Boleo and other Mexican mines became prominent, and the first great mines of Arizona were opened.

The beneficial influence of the copper industry upon the mining and metallurgical methods of the world has been most marked. The first smelting was probably done from copper ores. The Bessemer process is used in copper refining as well as in the making of steel. Many important advances in metallurgical processes have been contributed by copper smelters, and of these, the latest, and perhaps the greatest, is electrolytic refining, which will be found treated of more extensively in the chapter on metallurgy.

The United States remains much the most important copper producer, furnishing upwards of one-half of the total supply of the globe. During the first five years of the Twentieth Century there have been important changes in the American copper industry. Montana remains the foremost producer, and although it appeared, a few years ago, as though this state had reached nearly its maximum production, owing to declining values and extensive litigation, settlement of the legal troubles has released for production many properties hampered in output or entirely idle, and more extensive developments at depth have shown the continuance of rich veins, below the limit of impoverishment formerly considered established.

The Lake Superior district of Michigan is showing a steady gain in output. This is the lowest in grade among the great copper districts of the world, and as at least five years are required for the opening of a large new mine, the full effect of new development cannot be felt until years after begun. The amount of new work under way in this district is greater than ever before, and it is safe to predict a steadily increased annual output for at least five years to come.

Arizona has overtaken Michigan as a producer. While Arizona usually is treated as an entity, it should be borne in mind that there four main producing districts and a number of developing fields in this territory. The Warren, or Bisbee, district, leads in production, closely followed by the Clifton-Morenci district of Graham county. Developments in the Globe district of Gila county are unusually promising, forecasting a greatly increased output. The Jerome district of Yavapai county shows a small gain only, but work now under way should result in the opening of several new producers. Among the newer Arizona fields of importance are the Silver Bell and Helvetia districts of Pima county. There is scarcely a county, in this great territory of more than 100,000 square miles area, that does not possess copper deposits of promise.

Utah takes fourth place among the producing states and territories of the country, and may take a higher rank eventually. At no point on the globe are there copper developments of greater promise than in the Bingham or West Mountain district of Salt Lake county, Utah. The utilisation of the monsonite ore bodies of this district must result in the making of mines of the very first magnitude. The Beaver county deposits of Utah, long considered promising, at last have a producing mine that is making copper on a profitable commercial basis.

California has copper deposits of more or less promise in upwards of half of its counties. The really important developments to date, however, are confined to the single northern county of Shasta, and recent work in this district has resulted in the opening of several important new mines.

Nevada is as yet a very small producer, but new mines of great promise are being opened in White Pine county, and should become considerable producers during 1907. There also are developments of promise under way in Eureka and Lincoln counties, with prospects of making good mines elsewhere eventually.

Wyoming has been marking time, and has not made good the expectations of production entertained at the beginning of the century. New Mexico remains a small producer only, but development work of importance is under

way in Grant county, and should result in making this territory a considerable producer of the metal within the next two or three years. Colorado makes a few million pounds of copper yearly, mainly as a by-product from ores of gold, silver, lead and zinc. Idaho, Washington and Oregon all have copper deposits of promise, on which more or less work is being done. Alaska became a producer, to the extent of several million pounds of fine copper, during 1904, and has several promising mines under development.

In the east and south, the only work of prime importance is under way in Tennessee, where there are two mines that are earning substantial profits, with prospects of a considerably increased production. Virginia, North Carolina and Georgia have copper deposits of value, and eventually should develop mines of commercial importance. In Vermont a little work only is under way.

Canadian production has shown no large gain for several years, but the industry has by no means been at a standstill. The Granby is, without doubt, one of the great copper mines of the world, and has neighbors in the Boundary district that are making important mines. The Pacific Coast mines of British Columbia have not developed as satisfactorily as was anticipated, but this field is by no means devoid of promise. In eastern Canada the Algoma district, while as yet a comparatively small producer, has mines of decided promise.

Mexico now ranks second only to the United States in copper output, and in addition to the Greene and Boleo has at least a dozen other properties of high promise. The country is one of the richest on the globe in minerals, and must become an increasingly important field of copper production.

In South America, Chile remains the most important producer, but is making only a little more metal than three decades ago, when it led the world in production. The most important work now in progress in South America is noted in the Cerro de Pasco district of Perú, where an unusually strong American company has consolidated numerous small holdings, and is making what promises to prove a mine of the first magnitude. Bolivian copper deposits, while promising, are hampered by lack of rail connections, but this disability is to be removed shortly. Argentina has highly promising copper measures, but development is progressing at a very slow rate. Venezuela has copper mines of proven merit, but these are idle, and will remain closed as long as political conditions continue so unsatisfactory as at present. Colombia, Ecuador and Brazil have copper measures that undoubtedly will make important mines, in time, but as yet little is being done in the way of development.

Spain remains much the most important European producer, and takes third rank in copper output among the countries of the world. Spanish production is on a thoroughly stable and satisfactory basis, but development is not as active as in many other countries, and does not seem as vigorous as is warranted by the numerous ore bodies of promise available for exploitation.

Germany is slightly increasing production, but the German mines are low in grade, though with ore bodies of vast extent, and, like the mines of Lake Superior, years are required to reap the full benefit of new development. Norway is increasing her output, and is perhaps the most promising field for new copper mining work to be found in Europe, at present. Swedish produc

tion remains small. British production is but a few hundred tons of fine copper yearly, but several old Irish mines are being reopened. Italy is increasing production materially, but the increased output is due almost entirely to the activity of a single corporation, the enterprising Montecatini company. Turkish production remains practically stationary, and conditions are not favorable to extensive development. The output of copper in Russia shows but little change, and apparently new ore measures are not being developed as rapidly as the more important ore bodies under exploitation are being exhausted.

Siberia has some very promising mines, but heretofore development has been hampered by lack of adequate transportation facilities, lack of capital and lack of modern machinery, methods and management. The most important development in the history of Siberian copper mining is the taking over of the Yuspenskii mine by the Spassky company, this property giving much promise.

The continent of Asia contains, without doubt, very many large and rich bodies of copper ore, but there are few mines of importance, outside of Siberia. China has promising properties, and a start has been made at opening and equipping these on a modern scale. The great awakening now taking place in China, coupled with the frugality, industry and business ability of the Chinese, must result in the upbuilding of an important copper industry.

Japan shows as great ability in the arts of peace as in those of war, and while the Japanese copper deposits are inferior in richness and extent to those of many other countries, there is no nation that is making better use of its natural resources, and Japanese copper production is increasing steadily, and will increase for some years to come, Japan already taking fourth place among the copper producing countries of the globe.

African production remains small, the mines of Little Namaqualand, Cape Colony, merely holding their own, after fifty years of activity. There are indications that copper mines may be made in the Transvaal, eventually, where the glamour of gold has blinded miners to everything else. Natal and Zululand have copper deposits worthy of investigation, and Rhodesia has at least two partially developed mines of promise. The Congo Free State has copper measures of unusual promise, that eventually should make important mines.

Australia is a country of great mineral wealth, and for several decades, in the latter half of the Nineteenth Century, was well to the front in mining practice, but for the past quarter century seems to have lagged from the van. There are indications that a brighter day is dawning for Australian mining, the example of two exceptionally well managed copper mines being likely to have a beneficial effect upon the industry. The decision of the Mount Morgan to turn its gold mine into a copper mine probably marks the inception of another large copper producer. Hitherto the development of Australian copper mines has been greatly hampered by the mistaken plan of operation followed by a great majority of the mining companies, which have endeavored to secure their production mainly from rich ores, whereas the great copper mines of the world, almost without exception, are those that handle enormous tonnages of base or low-grade ores.

CHAPTER II.

THE GEOLOGY OF COPPER.

In this chapter no attempt is made to give more than the merest outline of the geological features of special interest, pertaining to copper. Geology is, at best, largely an empirical science. From its very nature it can never be made such an exact science as chemistry and mineralogy have already become. This is said in no carping spirit of criticism against the exponents of scientific geology, for their work is of a highly valuable nature, and if the geological dogmas of the present day contain a greater amount of assumption in proportion to ascertained and demonstrable fact than is found in cognate branches of scientific research, the empirical nature of a considerable part of the geology taught at the beginning of the Twentieth century is due to the inherent difficulties of the subject, rather than to any desire of geologists as a whole to assume more than can be proven. Just as a forest of scaffolding is erected around the walls of a great cathedral, while building is in process, so a false-work of theory is indispensable in geological research. Behind the great mass of temporary timbering the granite walls of truth are rising, slowly but surely, and as they rise, the scaffolding that once was necessary becomes useless, and is discarded.

Rocks are divided into three geological classes, the igneous, sedimentary and metamorphic. The igneous rocks, fused by subterranean fires and ejected in sheets by volcanic action, or oozing forth from cracks in the earth's crust, may be divided into granitic, porphyritic and vitreous forms. The sedimentary rocks were deposited by the action of water, usually on beds of former seas. The detrital material so deposited formed conglomerate, shale, sandstone and limestone strata, and in the case of the three first named, the material for sedimentary beds was necessarily obtained principally from the breaking down of the older igneous rocks. Strata of igneous and sedimentary rocks frequently alternate in the older geological groups. The metamorphic or third class, consists of altered rocks of the igneous and sedimentary forms, in which the phenomena of crystallization and replacement have been brought about subsequent to their deposition.

The Devonian system of the Paleozoic group was long regarded as the home of copper, possibly because of the preponderant importance of Cornwall and Devon as sources of copper supply until the middle of the Nineteenth century. Copper is more widely diffused over the earth in rocks of the Permian series of the Devonian system than in any other series of rocks, and the Permian strata are of very extensive occurrence. The Jurassic system of the Mesozoic, or age next younger than the Permian, is also

prolific in copper. While the Permian beds show more or less copper in most places where outcropping extensively or carefully developed, the percentage of copper contained is apt to be small, though the aggregate of copper so deposited is past computation, owing to the dissemination of the ores through beds that are of vast area.

While native copper is of very frequent occurrence, and is noted in most cupriferous districts, the virgin metal is usually an alteration product, and of little commercial importance. In the Coro Coro district of Bolivia and the Keweenaw district of Lake Superior, native copper is found in such quantities as to permit of its extraction upon an immense scale. The Bolivian copper is found in two adjoining conglomerates, composed mainly of argillaceous sandstones, and of somewhat uncertain geological age. The Lake Superior copper occurs in conglomerate and amygdaloid beds, probably of the Azoic group, though the exact geological horizon is still a matter of dispute. The native metal is most frequently found in eruptive zones, at the various points where it occurs in very considerable quantities, in the sedimentary rocks, such as conglomerates and sandstones, or in the trappean rocks of igneous origin, and more especially in the metamorphosed traps. As an alteration product, native copper may occur in the altered or oxy-carbonate zone of any copper ore body.

The source from which copper came and the manner of its deposition are largely matters for conjecture, though certain features bearing on these questions are fairly well established. The metal and its ores are in all likelihood of igneous origin, coming to the earth's surface or to its crust with the molten magma forced upward from unknown depths. As to the manner of its deposition in veins or beds, there are many theories, of which those most commonly held may be divided into two classes, the first holding that the metal and its ores were deposited in various rock strata and veins from solutions, while the second set of theories is built upon the primary thesis that copper—and other minerals—were deposited by electro-chemical action from sea water, in which process the remains of living organisms are presumed to have played an important part. Both theses have certain corroborative evidences, and both have weak spots. It is possible that ore deposits have come from both sources. It is certain that the sea holds nearly all metals in solution, but, on the whole, the theory of deposition from subterranean solutions seems the most easily tenable.

The more common metals are found as component parts of many ordinary igneous rocks, though in such small quantities that these rocks cannot be considered as ores of even the lowest grade. It is possible, and indeed probable, in the light of the limited amount of exact knowledge now possessed on this point, that subterranean and slightly carbonated surface waters percolating through the various rock strata, very few of which are impervious to water, leached out certain soluble constituents, and that the minerals, so carried in solution, were deposited, usually in crystallized form, in the brecciated rocks and in the numerous cracks in the crust and upper strata of the earth. Carbonic acid, oxygen and sulphur have been the princi-

pal reducing agents, carbonic acid gas in water being a powerful solvent. The action and inter-action of these three prime agents, assisted by other reagents set free by them, have caused complex reactions, many of which have been figured out to theoretical perfection, while not a few supposedly natural reactions have the corroborative evidence afforded by synthetical chemical experiments that have given the reactions first established theoretically. In the case of the rich iron ores of the Lake Superior district, their concentration from leaner ores by purely natural means is no longer open to question, except from the ultra-skeptical.

A third theory, once generally held, but now in disfavor, remains to be noted. This is the idea that electrical action caused the deposition of the metals. While the theory now finds few adherents, I must venture the opinion, at the risk of being considered fossilized, that electrical action has played a most important part in the deposition of many metalliferous beds. There are really but two sciences, one being mathematics, which is abstract and perfectable, while the second is the science of the concrete, embracing all matter and its various manifestations. For convenience, the realm of science, an empire vaster than Alexander swayed or Napoleon planned, has been divided into so-called sciences and groups of sciences, but the boundary lines are merely arbitrary abstractions, and have as little physical existence as the equator or the meridians of longitude. Geology shades imperceptibly into mineralogy, which in turn merges into chemistry, dynamics, optics, and electricity. All sciences are interwoven, and electricity, a manifestation of one of the attributes of matter, is an integral part of every other concrete science, from geology to biology, affecting alike the organic and inorganic kingdoms. It is probable that terrestrial magnetism, percolating waters and precipitation from superincumbent seas all played a part in the formation of ore deposits, operating under chemical, thermo-dynamical and electrical conditions of which we now have merely a slight theoretical knowledge. Mother Nature filled the recesses of her myriad subterranean treasure-houses with the wealth that man now wrests from her by brute strength, and the little craft he has been enabled to acquire in the prolonged struggle.

In connection with the foregoing remarks upon the influence of electricity on mineral deposits, it may be remarked that there are puzzling magnetic earth-currents in the Lake Superior native copper districts, these being especially marked upon Isle Royale, where the variation of the magnetic needle is remarkable. It is to be hoped that these phenomena will be given the careful scientific investigation that their importance warrants, at some not distant date. Shortly after the laying of the first Atlantic cable, Ayers Stockley, still a resident of the Lake Superior district, performed some highly interesting experiments in subterranean telegraphy. His apparatus was home-made, but he succeeded in telegraphing for some miles along one of the magnetic currents traversing the cupriferous strata of Ontonagon county, with the crude but effective instruments of his own devising.

It is still a matter of dispute whether many of the great bodies of

chalcopyrite and cupriferous pyrite and pyrrhotite are veins or beds. Recent investigation leads to the belief that many of the deposits formerly called beds are in reality entitled to the appellation of veins.

The great predominance of sulphide ores of copper is a notable fact, 75 per cent. of the world's production of the metal coming from ores of this class. It is probably safe to assume that all, or practically all, copper ores were originally sulphides. Chalcopyrite is generally held to be a product of crystallization from fusion. Eventually the upper portions of these chalcopyrite and bornite ore bodies were altered, in the case of the older deposits, mostly to oxide and carbonate ores. In all likelihood this alteration came about from the action of water. The subterranean waters found in all rock strata at greater or less depth, are not oxydising, but the surface waters have an affinity for carbonic acid, and, carrying this gas in solution, these surface waters, percolating through the rock strata and veins, attack the sulphide ores, which gradually yield up sulphur and become carbonates and oxides, through chemical reactions induced by carbonic acid. For this reason the permanent water level of a mine usually marks the lowest depth at which oxide and carbonate ores are found, and below this point the ores are nearly always sulphides, with a strong tendency toward lower percentages of copper and higher percentages of iron, as depth is gained.

As chalcopyrite and bornite (compound sulphides of copper and iron) are overwhelmingly the most common ores of copper, and, below the permanent water level, practically the only copper ores, the alteration of these iron-copper sulphides to oxide and carbonate ores (or sometimes to silicates, or the higher sulphides of copper alone) by the action of percolating surface waters, charged with carbonic acid, necessarily sets free one atom of iron for each atom of copper dissociated from the original chemical union, in which one atom each of copper and iron were united with two atoms of sulphur. The iron also forms carbonates or oxides, most usually the latter, and, in the form of limonite, a hydrated sesquioxide of iron, is carried upward in the waters, and stains the rock above or near the surface of the original deposit of chalcopyrite. The characteristic rusty-iron stain of limonite is a prominent feature of the rock-capping surmounting many of the largest copper ore bodies, and this "gossan" or "iron hat" is a welcome sign of copper values below, in nearly every copper-ore mining district of the world. It is not an invariable sign, however, as it is necessarily lacking in many places, such as at imbedded deposits having no outcrop, and unaltered sulphide ore bodies, also at points where the original capping has been removed by surface erosion or glaciation. The gossan may also be found at many points where copper does not lie beneath, but, as a rule, a capping of gossan is a highly favorable sign in a cupriferous district.

The rich oxide and carbonate ores existing at and near the surface in most copper-bearing districts (except in the native copper fields) may safely be considered alteration products from the chalcopyrite and bornite ores found at greater depths. The silicates, phosphates and other ores are probably alteration products also, as are the higher sulphides of copper in which

iron is not present, unless as an impurity. In some districts the unaltered sulphides extend to the surface, but this is the exception rather than the rule. The depths to which the carbonate and oxide ores may extend is dependent upon local conditions, and ranges from a few feet to more than one thousand feet. As a rule, the oxide and carbonate and richer sulphide ores (such as chalcocite) give way to unaltered sulphides of copper and iron at the permanent water level. In cases, not so very common, where the altered ores exist below the water level, it is presumed that the alteration occurred during some antecedent age or ages, when the water level was lower, or the rock strata higher. The native copper deposits remain absolutely unaltered in nature or quantity below the water level, which apparently has no effect upon deposits of the virgin metal.

In this place, it may not be amiss to insert a few words of warning and advice to those lacking extended experience in copper mining. It is undoubtedly true that a geologist of high scientific attainments may make a poor fist at practical mining. Possibly this rule may be considered proven by the brilliant exception recently made by Dr. L. L. Hubbard, who stepped direct from the position of state geologist of Michigan to the general management of a corporation owning undeveloped lands, and within a few months opened what must become one of the greatest copper mines of the world within the next few years. On the other hand, the practical miner to whom is entrusted the development of a new copper mine, may profit greatly by bearing in mind a few facts that are not only geological maxims, but proven by innumerable practical illustrations. It is certain that copper mines—always excepting those producing the native metal—are subject to greater changes with depth than mines of any other class. All mines vary more or less, in width of productive openings and in the values found therein, as depth is gained, but copper ore mines, while varying in width and values with depth just like mines of other metals, are subject to a special series of variations, an understanding of which is of prime importance to owners and managers. In strong veins, where iron-copper sulphides are first encountered, a continuance of the vein to a considerable depth, with comparatively slight alteration, may reasonably be looked for. This does not apply to gash veins, of course, as these are invariably shallow, but the experienced miner is not likely to long mistake a gash vein for a true fissure. In other cases, where the surface openings show rich oxides and carbonates, or chrysocolla and similar ores, it should always be borne in mind that these ores cannot prove permanent. They may extend downward for a few score feet only, or possibly may hold for many hundreds of feet, but sooner or later they will give way at depth to unaltered iron-copper sulphides, as will copper glance or other high-grade ores. The oxides and carbonates, from their richness in metal and the ease with which they may be smelted, are highly desirable ores, and have been the making of many good mines that otherwise would have proven failures, through affording profits with which to open more extensive bodies of lower grade ore at greater depth, and to build and equip the large

and costly smelters required for successful treatment of the iron-copper sulphides.

For the reason that a change at depth is inevitable, it is highly important that a new copper mine having high-grade surface ores should prove its property before forming a permanent plan of mining, smelting and financial conduct. This can be done in one way only, and that is by probing the ground. The probing may be done by diamond drills, or by sinking shafts. Diamond drilling is a wonderful aid in exploring new territory, but at best it is only a sort of blind-man's-buff. As a preliminary measure diamond drilling is highly commendable, but for a certainty the shaft or tunnel is the thing. Where a mine is already opened on rich copper ores, sinking is the proper course. This will determine the extent of the richer ore bodies and the nature of the unaltered sulphides. At times highly profitable oxides and carbonates are replaced by sulphides of too low grade to work at a profit. More frequently the richer ores are replaced at depth by sulphides that can be profitably worked, provided a sufficiently extensive mechanical and metallurgical equipment is supplied. As a rule, the better a copper mine at surface, the better at depth, but there are such important exceptions that development is the only safe guide.

For the reasons set forth in the foregoing paragraphs, it is important that the management of a copper ore mine have more than a surface knowledge of its property before laying out permanent plans. Handsome profits may be earned from surface and sub-surface ores, but if these be paid out in dividends as quickly as earned, the change in the ore, certain to come at some depth, may leave the company with a depleted treasury to face the problem of raising large sums for development and equipment. Shareholders will pay assessments more readily on a new or developing mine than on one that has been a dividend payer. In connection with the advice contained in the preceding paragraphs, there are sections in the chapter on metallurgy of interest to those lacking experience who may be responsible for the development of new mines. To the experienced mining men I am not offering advice. Such men are always seeking for information to add to their already extensive stocks, but they do not hanker for advice.

The various chapters on the ore deposits of the world will be found to contain a great amount of geological matter of a more specific nature than given in the preceding pages, and geological data of a still more detailed nature will be found in many of the descriptions of mines. In the chapter on chemistry and mineralogy there are detailed descriptions of the physical and chemical characteristics of the metal and its various ores and minerals, of which the principal, from an economical standpoint, are native copper, chalcopyrite, bornite, chalcocite, malachite, azurite, tenorite, cuprite and chrysocolla.

CHAPTER III.

CHEMISTRY AND MINERALOGY OF COPPER.

In the following pages will be found a list of the ores and alloys of copper, with brief descriptions; the detail depending somewhat upon the importance or special interest possessed. The native metal itself is included in the list, which also gives the synonyms of the principal copper ores.

No attempt has been made to render this chapter exhaustive, despite its considerable length. Readers desiring further and more detailed knowledge of the various ores, including their optical properties, complete pyrognostics and crystallisation, are referred to the standard works on mineralogy. It is believed, however, that the pages appended may prove of some assistance to the general reader interested in the subject of copper, and possibly will interest the scientist as well, because of being the first encyclopædic list of exclusively copper minerals ever published.

Following is a list of the elements with which copper is found chemically united in nature. This list includes 29 of the 77 elements known to science at this writing. Following the name of each element is its chemical symbol and atomic weight, as now figured by the best authorities.

Element	Symbol	Atomic weight	Element	Symbol	Atomic weight
Aluminum	Al	27.1	Nitrogen	N	14.04
Antimony	Sb	120.	Oxygen	O	16.
Arsenic	As	75.	Phosphorus	P	31.
Bismuth	Bi	208.3	Platinum	Pt	195.
Calcium	Ca	40.1	Selenium	Se	79.2
Carbon	C	12.	Silicon	Si	28.4
Chlorine	Cl	35.45	Silver	Ag	107.93
Cobalt	Co	59.	Sulphur	S	32.06
Copper	Cu	63.6	Tellurium	Te	127.5
Hydrogen	H	1.01	Tin	Sn	119.
Iron	Fe	56.	Tungsten	W	184.
Lead	Pb	206.9	Uranium	U	240.
Manganese	Mn	55.	Vanadium	V	51.4
Nickel	Ni	58.7	Zinc	Zn	65.4
Niobium	Nb	93.7			

The elements with which copper unites most frequently are as follows, in approximate order of frequency and preference: Sulphur, oxygen, carbon, arsenic, antimony, bismuth, silica, chlorine, phosphorus, nitrogen, selenium, wolframium (tungsten), uranium, and vanadium.

The ores of copper (alone or with other metals) may be divided into the following groups:

Antimonides	Oxides	Sulphoarsenites
Arsenates	Oxychlorides	Sulphides
Arsenides	Phosphates	Sulphates
Arsenites	Selenides	Sulphobismuthites
Carbonates	Selenites	Tellurides
Chlorides	Silicates	Tungstates
Molybdates	Sulphoantimonates	Uranates
Niobates	Sulphoantimonites	Vanadates
Nitrates	Sulphoarsenates	

An alphabetical list of copper minerals, and alloys, including native copper and synonyms, is appended.

ADAMITE. Essentially a hydrous arsenate of zinc, but copper may replace the zinc to extent of from a trace to 23.5% cupric oxide.

AIKINITE. PbCuBiS_3 . Common names: Needle ore, acicular bismuth. Copper 11%, bismuth 36.2%, lead 36%, sulphur 16.8%. Orthorhombic. Crystals embedded; acicular, striated; also massive. Fracture: Uneven. Hardness: 2 to 2.5. Gravity: 6.1 to 6.8. Luster: Metallic. Color: Blackish lead gray, tarnishing to pale copper red. Opaque. Fuses on charcoal. Soluble in nitric acid. Occurrence: Ural Mountains of Russia, and Gold Hill, North Carolina, U. S. A.

ALASKAITE. An argentiferous galena-bismuthite in which lead is partially replaced by silver, 3.25% to 8.75%, and copper 3.5% to 5.1%, with traces of zinc, antimony and iron.

ALGODONITE. Cu_3As . Copper 83.5%, arsenic 16.5%. Occurrence: Chile and Lake Superior.

ALISONITE. A sulphide of lead and copper. Probably $3\text{Cu}_2\text{S}$, PbS .

ALUMINUM BRONZE. An alloy of copper and aluminum.

AMMIOLITE. Antimonite of copper and mercury. Cupric oxide 15.5% to 18%.

ANDREWSITE. A phospho-silicate of copper, iron, manganese and aluminum. About 11% cupric oxide.

ANNIVITE. A bismuthiferous stibio-arsenate of copper, carrying about 4% iron and 2% zinc. A complex mineral of the tetrahedrite-tennantite family.

ANTIMONIAL COPPER. Chalcostibite.

ANTLERITE. A basic sulphate of copper with traces of zinc and calcium; chemical formula uncertain, contains cupric oxide 67% to 68%.

APHTONITE. A tetrahedrite carrying silver, iron and zinc.

ARNIMITE. 5CuO , $2\text{SO}_3 + 6\text{H}_2\text{O}$. Copper 45.5% to 48%.

ASPEROLITE. Probably CuSiO_3 , $3\text{H}_2\text{O}$. Same as chrysocolla, except in excess of water.

ATACAMITE. $\text{Cu}_2\text{ClH}_3\text{O}_2$. Copper 15.9%, cupric oxide 55.8%, chlorine 16.6%, water 12.7%. Cleavage: Imperfect to perfect. Fracture: Conchoidal. Brittle. Hardness: 3 to 3.5. Gravity: 3.75 to 3.77. Luster: Adamantine to vitreous. Color: Emerald to blackish green. Streak: Apple-green. Transparent to translucent. Occurs as sandy granules in the province of Atacama, Chile, where first discovered, also at many other points. A valuable ore of copper where found in commercial quantity.

ATELITE. A hydrated cupreous bi-chloride, $2\text{CuO}\cdot\text{CuCl}_2\cdot 3\text{H}_2\text{O}$. From crater of Vesuvius, apparently at pseudomorphs after tenorite, and nearly the same as atacamite chemically.

ATLASITE. A copper chloro-carbonate apparently between atacamite and malachite. From Chanarcillo, Chile.

AURICHALCITE. $2(\text{ZnCu})\text{CO}_3\cdot 3(\text{ZnCu})(\text{OH})_2$. A basic carbonate of copper and zinc. Carries about 21% cupric oxide. Monoclinic in acicular crystals, forming drusy incrustations; also columnar, laminated and granular. Hardness: 2. Gravity: 3.5 to 3.6. Luster: Pearly. Color: Pale green to sky blue. Streak: Light green to light blue. Translucent. Soluble in acids. Occurs in small quantities at numerous points.

AZURITE. $3\text{CuO}\cdot 2\text{CO}_2\cdot \text{H}_2\text{O}$. Common names: Blue carbonate of copper, azure copper ore. Monoclinic; also massive to earthy. Cleavage: Perfect, but interrupted. Fracture: Conchoidal. Brittle. Hardness: 3.5 to 4 (Gravity) 3.77 to 8.83. Luster: Vitreous. Color: Azure blue. Streak: Light blue. Transparent to subtranslucent. Soluble in nitric acid. A fairly common ore of copper.

BARNHARDTITE. Apparently a chalcopyrite partly altered to chalcocite, by loss of part of iron content. Assays 47% to 50% copper and 20% to 22.5% iron.

BAYLDONITE. A hydrous arsenate of copper and lead, carrying about 26% copper.

BELL-METAL ORE. Stannite.

BERZELIANITE. A selenide of copper, Cu_2Se . Copper 61.6%. Part of copper replaced with silver at times.

BEUDANTITE. A complex and somewhat uncertain arseno-phosphate or phospho-arsenate of iron, copper and lead, with sulphates of the metals present in varying quantities. Contains 8.5% to 12.3% cupric oxide.

BINNITE. $3\text{Cu}_2\text{S}\cdot 2\text{As}_2\text{S}_3$. Copper 39.2%. Carries also a little lead, iron and silver.

BJELKITE. A cupriferous cosalite.

BLANCHED COPPER. An alloy of copper and arsenic.

BLUESTONE. Sulphate of copper. Blue vitriol. Chalcanthite.

BOGOSLOVSKITE. Apparently an impure chrysocolla, carrying carbon dioxide.

BOLEITE. Apparently a variety of percyllite carrying chloride of silver. Has 14% to 15% copper, 48% to 51% lead and about 9% to 10% silver. From Boleo mine, Mexico.

BORNITE. Cu_5FeS_4 . Copper 55.5%, Iron 16.4%, sulphur 28.1%. Common name: Peacock copper ore. Isometric; many hexagonal penetration twins. Habit, cubic. Massive. Structure: granular or compact. Fracture: Small conchoidal, uneven. Brittle. Hardness: 3. Gravity: 4.9 to 5.4. Luster: Metallic. Color: Copper red to bluish brown, quickly tarnishing to iridescence. Streak: Pale grayish black. Opaque. Soluble in nitric acid with separation of sulphur. Occurrence: In most of the important copper fields of the world. Uses: The second most important ore of copper.

BOURNONITE. PbCuSbS_4 . Copper 13%, lead 42.5%, antimony 24.7%, sulphur 19.8%. Massive; granular and compact. Crystals, orthorhombic. Cleavage: Imperfect. Fracture: Subconchoidal to uneven. Rather brittle. Hardness: 2.5 to 3. Gravity: 5.7 to 5.9. Brilliant metallic luster. Color and Streak: Steel gray, inclining to blackish lead-gray or iron black. Opaque. Fuses easily on charcoal. Decomposed by nitric acid. Occurrence: Hartz Mountains and Saxony, Bohemia, Hungary, Carinthia, Cornwall, Chile, Bolivia, Peru, Canada, Arkansas, Colorado, etc.

BRASS. An alloy of copper and zinc, about 2 parts copper to 1 of zinc.

BROCHANTITE. A basic sulphate of copper. $4\text{CuO} \cdot \text{SO}_3 \cdot 3\text{H}_2\text{O}$, carrying 70.3% cupric oxide.

BRONZE. An alloy of copper and tin. The varying proportions give differing colors and qualities, such as bell-metal, medal bronze, gun-metal, etc.

CACHEUTAITE. A selenide of lead, copper and silver, with occasional traces of cobalt and iron, carrying 7% to 36% copper.

CALCIOVOLBORTHITE. A hydrous vanadate of copper, calcium, magnesium and manganese. Copper 30% to 35%.

CALIDONITE. A basic sulphate of lead and copper. Chemical composition uncertain. Cupric oxide about 10%.

CANTONITE. A dimorphic variety of covellite crystallized in cubes, with cubical cleavage.

CAPILLARY RED OXIDE OF COPPER. Cuprite.

CARROLLITE. $\text{CuS} \cdot \text{Co}_2\text{S}_3$. Copper 20.5%, cobalt 38%, sulphur 41.5%. Occurrence: Carroll county, Maryland.

CASTILLITE. A bornite of uncertain formula, carrying approximately, copper 41%, zinc 12%, lead 10%, silver 4%, iron 7%.

CHALCANTHITE. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Common names: Blue vitriol, bluestone, sulphate of copper. Carries about 25% copper. Triclinic. As crystals, also massive, stalactitic and reniform, sometimes with fibrous structure. Luster: Vitreous. Color: Sky blue. Subtransparent to translucent. Soluble in water. Solution will deposit metallic copper on iron.

CHALCOCITE. Copper glance. Cu_2S . The richest sulphide ore, carrying copper 79.8%, sulphur 20.2%, also frequently iron or silver in small quantities. Orthorhombic: Also massive, with structure granular to compact and impalpable. Cleavage: Indistinct. Fracture: Conchoidal. Somewhat brittle. Hardness: 2.5 to 3. Gravity: 5.5 to 5.8. Luster: Metallic. Color and Streak: Blackish lead-gray, tarnishing to dull green or blue. Opaque. Soluble in nitric acid. Occurrence: In nearly all sulphide copper districts of the world in small quantities, occasionally in considerable bodies. Uses: The richest commercial ore of copper.

CHALCOPYRITE. CuFeS_2 (or $\text{Cu}_3\text{S}_2\text{Fe}_2\text{S}_3$). Copper 34.5%, iron 30.5%, sulphur 35%. Frequently mixed with pyrrhotite; occasionally carries gold or silver. Tetragonal; sphenoidal, often twinning; also frequently massive and compact. Fracture: Uneven. Hardness: 3.5 to 4. Gravity: 4.1 to 4.3. Luster: Metallic. Color: Brass yellow, often tarnishing to iridescence. Streak: Greenish black. Opaque. Soluble, except sulphur, in nitric acid. On being heated yields up a portion of its sulphur. On exposure to moisture and heat becomes hydrated, and copper and iron change readily to sulphates. Occurrence: In every copper field of importance. The most common ore of copper, and the source of nearly 75% of the world's supply of the metal.

CHALCOMENITE. A hydrous selenite of copper. $\text{CuSeO}_3 \cdot 2\text{H}_2\text{O}$. Carries about 35% cupric oxide and 48% selenium dioxide.

CHALCOPHYLLITE. A highly basic arsenate of copper; formula given variously—simplest is $7\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 14\text{H}_2\text{O}$. Percentage of cupric oxide 44.5% to 53%.

CHALCOPYRRHOTITE. Fe_3CuS_4 . Copper 13%, iron 48%, sulphur 38%. Occurrence: Cuba and Sweden.

CHALCOSIDERITE. $\text{CuO} \cdot 3\text{Fe}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$. Cupric oxide about 8%.

CHALCOSINE. Chalcocite.

CHALCOSTIBITE. $\text{Cu}_2\text{S} \cdot \text{Sb}_2\text{S}_3$. Essentially a sulpho-antimonide of copper, carrying about 25% copper, 48% antimony, 26% sulphur, with 1% to 2% iron and occasionally a fractional percentage of lead.

CHALCOTRICHITE. A form of cuprite with capillary or acicular crystallization.

CHENEVILKITE. A hydrous arsenate of copper and iron, formula uncertain. Cupric oxide about 26.3%.

CHESSY COPPER. Azurite.

CHILENITE. Probably Ag_3Bi , with copper replacing silver to extent of about 7%.

CHIVIATITE. A sulphide of lead and bismuth in which lead is partly replaced by copper to extent of about 2.5%. Occurrence: Chivato, Peru.

CHLOANTHITE. Empirically NiAs_2 , a diarsenide of nickel. In analyses invariably shows cobalt and iron, and frequently traces of copper

bismuth, antimony, lead and silver. The ease with which partial replacement of the nickel is effected in both chloanthite and smaltite calls attention to the minerals keweenawite and mohawkite, which, though lower in the series of arsenides, are very properly described by Dr. Koenig, the discoverer, as compound arsenides, the formula being written (CuNiCo) . The same formula might be used to advantage with chloanthite, smaltite and sundry other arsenides of protean forms.

CHLOROTILE. $\text{Cu}_2\text{As}_2\text{O}_7 \cdot 6\text{H}_2\text{O}$. Carries about 32.5% copper. A hydrous arsenate of copper. Orthorhombic; fibrous and massive. Soft. Color: Pale emerald green. Transparent.

CHRYSOCOLLA. $\text{CuSiO}_3 \cdot 2\text{H}_2\text{O}$. Carries about 36.1% copper. Common name: Mountain green and Mountain blue. Cryptocrystalline, enamel-like. Sometimes botryoidal. Fracture: Conchoidal. Brittle and somewhat sectile. Hardness: 2 to 4. Gravity: 2 to 2.24. Luster: Vitreous to earthy. Color: Mountain green, bluish green, sky blue to turquoise blue. Impure varieties, brown to dull black. Streak: White from pure varieties. Translucent to opaque. Decomposed by acids without gelatinisation. Occurrence: Frequently with other ores, especially in upper portions of veins.

CLARITE. Probably a dimorphous form of enargite.

CLAYITE. A stibio-arsenate of lead, with lead replaced to extent of about 8% copper and a trace of silver.

CLINOCLASITE. $6\text{CuO} \cdot \text{As}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$. Carries 48% to 50% copper. / hydrous arsenate of copper. Cleavage: Highly perfect. Brittle. Hardness: 2.5 to 3. Gravity: 4.19 to 4.36. Luster: Vitreous to resinous. Color and Streak: Bluish-green. Subtransparent to translucent. Soluble in nitric acid. Occurrence: Cornwall and Utah.

CONDURRITE. A soft, black copper ore, found in Cornwall; supposed to be an alteration product of tennantite.

CONICALCITE. An arsenate of copper and calcium, carrying occasionally zinc and vanadium. Cupric oxide about 28% to 32%.

CONNELLITE. A hydrous sulpho-chlorate of copper, carrying 72.3% cupric oxide.

COPPER. Cu . Native copper. The chemical symbol Cu is an abbreviation of cuprum, the Latin word for copper. The metal, native or refined, has the following names in the modern languages: kupfer in German; kopper in Swedish; kobber in Norwegian; cobre in Spanish and Portuguese; cuivre in French; rame in Italian.

Atomic weight, 63.6. Belongs in the first group and is the leader of the fifth series of Mendeleef's Periodic System. The group is as follows: 1. hydrogen; 2. lithium; 3. sodium; 4. potassium; 5. copper; 6. rubidium; 7. silver; 8. caesium; 9. unknown (possibly terbium, atomic weight 160); 10. gold; 11. unknown. The fifth series, of which copper is the basic leader, is as follows: 1, copper; 2, zinc; 3, gallium; 4, germanium; 5, arsenic; 6, se-

lenium; 7, bromine. The three metallic elements falling between series four and five in Mendeleef's table, are iron, cobalt and nickel. The frequency with which these three elements are found associated with copper, and the ease with which all four metals replace one another are notable. The general resemblance between copper, silver and gold, which form ascending steps in the same group, is readily apparent. Mendeleef's Periodic System may not prove the key to unlock the chemical secrets of nature, but it may be compared to a single tumbler in a combination lock, which has been nearly set in its proper position for opening.

System of crystallization. isometric. Tetrahexahedronal forms the most common, with much twinning. Crystals often show cavernous faces and occasionally elevations. Crystals are often distorted and pass gradually through distortions into filiform and arborescent forms. Druses, often of considerable size, in Lake Superior native copper mines, notably the Central and Phoenix mines in Keweenaw county, afford many curious crystallizations, filiform and arborescent. Native copper also occurs massive, and in granular form, and in laminae. In the Lake Superior mines the metal occurs in all observed forms and sizes; in lamellar form, from microscopic flakes up to sheets of immense size and weight; in crystals of greatly varying form and size; in grains from microscopic size to considerable nodules, and in the various filiform and arborescent shapes in druses. The finest particles are grains and exceedingly minute flakes occurring in an upper sandstone of the Keweenaw series, while the largest masses, weighing upwards of 500 tons, have been found in contact and fissure veins in Keweenaw and Ontonagon counties, though the bulk of the copper produced is secured from the stratified igneous and sedimentary beds of the Keweenaw series.

Cleavage: None. **Fracture:** Hackly. **Tenacity:** Second only to that of iron. Perfectly sectile. Highly ductile and malleable, ranking in these particulars with the precious metals. **Electrical conductivity,** 931, as compared with 1,000 for silver, which possesses the most perfect electrical conductivity of any known metal or alloy. **Conductivity for heat,** 898, as compared with 1,000 for gold, the most perfect conductor of heat.

Hardness: 2.5 to 3. **Specific gravity,** in vacuo, at 0 degrees Centigrade (equal to 32°, or freezing point Fahrenheit), when chemically pure and devoid of porosity, is 8.945. **Specific gravity** of ordinary copper of commerce, none of which is free from impurities, varies from about 8.75 when cast to about 8.95 when rolled, hammered or drawn, the exact gravity depending upon how handled and extent and nature of impurities present.

Luster: Metallic. **Color:** Copper-red. **Streak:** Copper-red, metallic, shining. Tarnishes upon exposure of air to brownish red, and is liable to form a coating of verdigris or oxide upon long exposure to air. Atmosphere laden with moisture and carbonic acid is especially favorable for the formation of verdigris.

Fusibility: Copper is fusible at approximately 2,000° Fahrenheit, or a

trifle less than 1,100° Centigrade. Color, when fused, sea-green. Copper becomes volatile under the high temperature of the electric arc.

Solubility: Copper is soluble in nitric acid, aqua regia, and strong boiling sulphuric acid, also, slowly, in dilute hydrochloric and sulphuric acids, with admission of air. When in solution in nitric acid will deposit metallic copper on iron immersed therein.

Affinities: Copper has a greater affinity for sulphur than for any other element. Also possesses marked affinities for arsenic, antimony, bismuth, oxygen and carbon dioxide, and unites with many other elements.

Alterations: Native copper alters on exposure, especially in damp air, to the simpler oxide and carbonate ores, such as cuprite, malachite and azurite, and occasionally, in time, to the more complex ore forms.

Occurrence: Native copper occurs, usually in small quantities, in most of the principal copper-ore producing districts of the world. The native metal is mined upon a considerable scale only in Bolivia and Lake Superior, U. S. A. The Lake Superior district is notable for producing copper from deposits of the native metal almost exclusively. The Lake Superior native copper carries considerable silver, but no gold. In districts outside of Lake Superior and Bolivia the metal occurs most frequently in connection with the oxide and carbonate ores, and occasionally with the more common sulphide ores.

Impurities: The native copper frequently contains silver, arsenic, bismuth, antimony, zinc, iron and mercury. Commercial copper, refined from ores, may contain any of the elements already named, and also gold, lead, selenium and tellurium, the latter two elements in very minute quantities.

COPPER GLANCE. Chalcocite.

COPPER NICKEL. Niccolite.

COPPER PITCHBLEND. A ferruginous chrysocolla.

COPPITE. A tetrahedrite carrying about 13% of iron.

CORNWALLITE. $5\text{CuO}, \text{As}_2\text{O}_3, 3\text{H}_2\text{O}$. Cupric oxide 58.2%.

COSALITE. A sulphide of lead and bismuth in which lead is frequently displaced by copper to the extent of 1% to 9% and silver 1% to 16%.

COVELLINE. Covellite.

COVELLITE. Cupric sulphide. CuS . Copper 66.4%. An alteration product from chalcocite and other sulphide copper ores.

CREDNERITE. $\text{Cu}_2\text{Mn}_2\text{O}_7$. Cupric oxide 43%, manganese sesquioxide 57%. Monoclinic; foliated crystalline. Cleavage: Basal, very perfect; less distinct in other directions. Hardness: 4.5. Gravity: 4.9 to 5.1. Luster: Metallic. Color: Iron black to steel gray. Streak: Brownish-black. Soluble in hydrochloric acid.

CROOKESITE. A selenide of copper, silver and thallium, $(\text{Cu}, \text{Tl}, \text{Ag})_2\text{Se}$, carrying 44% to 46.5% copper, 1.5% to 5% silver and 16% to 18.5% thallium.

CUBANITE. CuFe_2S_4 . Copper 23.3%, iron 41.3%, sulphur 35.3%. Also carries silica, and sometimes small percentages of lead and zinc.

CUPRIC OXIDE. CuO . Monoxide of copper. One atom of copper and one of oxygen, chemically united.

CUPRITE. Cu_2O . Copper 88.8%, oxygen 11.2%. Common names: Octahedral copper ore; red glassy copper ore; ruby copper. Isometric; commonly in octahedrons; also massive, granular; sometimes earthy. Cleavage: Interrupted. Fracture: Conchoidal. Brittle. Hardness: 3.5 to 4. Gravity: 5.85 to 6.15. Luster: Adamantine to earthy. Color: Light to dark red. Streak: Shining brownish red. Subtransparent to subtranslucent. Soluble in concentrated hydrochloric acid. Found in most copper districts, especially near surface.

CUPROBISMUTITE. Essentially $3\text{Cu}_2\text{S}$, $4\text{Bi}_2\text{S}_3$, in which silver sometimes partly replaces the copper. Carries 7% to 16% copper, with slight amounts of silver and iron, and occasionally lead.

CUPRODESCLOIZITE. A complex hydrous arseno-phospho-vanadate of lead, zinc, copper, iron and manganese. Cupric oxide from 6.75% to 11.21%.

CUPROPLUMBITE. A sulphide of lead and copper; probably $\text{Cu}_2\text{S}, \text{PbS}$. Carries about 20% copper. From Chile.

CUPROSHEELITE. A tungstate of copper and calcium, carrying silica. Has 3% to 7% cupric oxide.

CUPROTUNGSTITE. Tungstate of copper: CuWO_4 . Carries about 30% cupric oxide.

CUPROUS OXIDE. Cu_2O . Two atoms of copper chemically united with one atom of oxygen.

CYANOCHALCITE. A phosphoriferous chrysocolla.

CYANOCHROITE. $\text{CuSO}_4, \text{K}_2\text{SO}_4 + 6\text{H}_2\text{O}$. Hydrous sulphate of copper and potash. Carries about 18% cupric oxide.

CYANOTRICHITE. Formula perhaps $4\text{CuO}, \text{Al}_2\text{O}_3, \text{SO}_3 + \text{H}_2\text{O}$. A hydrous basic sulphate of copper and aluminum. Cupric oxide 47% to 50%.

DARWINITE. Whitneyite.

DELAFOSSITE. An oxide of iron, copper and aluminum, carrying about 47.5% monoxide of copper.

DEMIDOVITE. A phosphoriferous chrysocolla.

DIHYDRITE. $5\text{CuO}, \text{P}_2\text{O}_5 + 2\text{H}_2\text{O}$. Carries about 55% copper. Monoclinic; massive; fibrous. Cleavage: Imperfect. Fracture: Conchoidal to uneven. Brittle. Hardness: 4.5 to 5. Gravity: 4 to 4.4. Luster: Adamantine. Color: Dark emerald green. Streak: Pale emerald green. Translucent. Soluble in nitric acid. Occurrence: Germany and the Urals.

DIOPTASE. H_2CuSiO_3 , or $(\text{CuO}, \text{SiO}_2, \text{H}_2\text{O})$. Cupric oxide 50.4%, silica 38.2%, water 11.4%. Common names: Emerald copper; emerald malachite. Rhombohedral; tetartohedral; also massive. Cleavage: Per-

fect. Fracture: Conchoidal to uneven. Brittle. Hardness: 5. Gravity: 3.28 to 3.35. Luster: Vitreous. Color: Emerald green. Streak: Green. Transparent to subtranslucent. Fusible with charcoal and soda. Gelatinizes with hydrochloric acid. Occurrence: Siberia, Hungary, Arizona, etc.

DOGNACSKAITE. A sulphide of bismuth and copper, carrying about 12% copper. From Hungary.

DOLEROPHANITE. A basic sulphate of copper, probably $2\text{CuO}, \text{SO}_3$, with 62.27% to 65.2% cupric oxide. A sublimation product from the laboratory of Vesuvius.

DOMEYKITE. Cu_3As . Common name: Arsenical copper. Carries 71.7% copper, 28.3% arsenic. Reniform and botryoidal; also massive. Fracture: Uneven. Hardness: 3 to 3.5. Gravity: 7.2 to 7.75. Luster: Metallic. Color: Tin white to steel gray, with iridescent tarnish. Occurrence: Lake Superior, Chile, Mexico and Saxony.

EHLITE. $5\text{CuO}, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries about 53% copper. Closely related chemically and in physical characteristics to pseudomalachite and dihydrite.

EMERALD COPPER. Diopside.

EMPLECTITE. $\text{Cu}_3\text{S}, \text{Bi}_2\text{S}_3$. Carries bismuth 62%, copper 19%, sulphur 19%, with occasional silver, iron, lead, and silica, also traces of tellurium.

ENARGITE. Cu_3As_4 . Copper 48.3%, arsenic 19.1%, sulphur 32.6%. Orthorhombic. Small crystals, also massive; granular and columnar. Cleavage: Perfect to indistinct. Fracture: Uneven. Brittle. Hardness: 3. Gravity: 4.45. Luster: Metallic. Color and Streak: Grayish black to iron black. Opaque. Fuses on charcoal. Soluble in aqua regia. Occurrence: South America, Mexico, Luzon in the Philippine Islands, also several American states.

EPIGENITE. Chemical formula uncertain. A sulpho-arsenide of copper and iron. Constituents by weight, about: Copper 41%, iron 15%, arsenic 12%, sulphur 32%. Orthorhombic. In short prisms, resembling arsenopyrite. Fracture: Uneven. Hardness: 3.5. Luster: Metallic. Color: Steel gray. Streak: Black. Soluble in nitric acid. Occurrence: Wittichen in Baden, Germany.

ERINITE. $5\text{CuO}, \text{As}_2\text{O}_3, 2\text{H}_2\text{O}$. Carries about 47.8% copper. Millated concentric crystalline groups; fibrous and rough. Brittle. Hardness: 4.5 to 5. Gravity: 4.04. Luster: Slightly resinous. Color: Emerald green. Streak: Grass green. Subtranslucent to opaque. Soluble in nitric acid. Occurrence: Cornwall and Utah.

ERUBESCITE. Bornite.

ERYTHROCALCITE. $\text{CuCl}_2 + 2\text{H}_2\text{O}$. Deliquesces on exposure. From crater of Vesuvius.

EUCAIRITE. A selenide of copper and silver. $\text{Cu}_2\text{Se}, \text{Ag}_2\text{Se}$. Copper 25.3%, silver 43.1%, selenium 31.6%.

EUCHROITE. A complex hydrous arsenate of copper, carrying 47.1% cupric oxide.

FAHLERZ. Tetrahedrite. Gray copper ore.

FAHLORE. Tetrahedrite.

FAMATINITE. Cu_2SbS_4 , arsenic occasionally replacing the antimony. Copper 43.3%, antimony 27.4%, sulphur 29.3%. Orthorhombic; Isomorphous with enargite; also massive. Fracture: Uneven. Brittle. Hardness: 3.5. Gravity: 4.57. Gray with copper-red tinge. Streak: Black. Opaque. Fusible on charcoal. Decrepitates in closed tube. Occurrence: Cerro de Pasco, Peru.

FIELDITE. A stibio-arsenate of copper, having about 37% copper, 7% zinc, 1.2% iron and traces of gold and silver.

FOOTEITE. Formula probably $8\text{Cu}(\text{OH})_2, \text{CuCl}_2 + 4\text{H}_2\text{O}$. A hydrous chloride of copper.

FOURNETITE. Probably a mechanical admixture of galena and tetrahedrite.

FREDERICITE. A tennantite carrying about 6% iron, 3.4% tin, 2.9% silver and 3.4% lead.

FREIBERGITE. A tetrahedrite carrying 26% to 31% silver, as well as small quantities of iron and zinc.

FRIGIDITE. A tetrahedrite carrying about 8% nickel and 13% iron.

GERHARDTITE. A basic cupric nitrate. $4\text{CuO}, \text{N}_2\text{O}_5, 3\text{H}_2\text{O}$. Contains 66.2% cupric oxide, 22.5% nitrogen pentoxide, and 11.3% water.

GERMAN SILVER. An alloy of about 5 parts copper, 2 parts zinc and one part nickel.

GLASBACHITE. Zorgite.

GRUENAUITE. A supposedly impure polydimite (nickel sulphide) carrying 11.5% copper, also bismuth, iron, cobalt and lead.

GUEJARITE. $\text{Cu}_2\text{S}, 2\text{Sb}_2\text{S}_3$. Carries about 15.5% copper, 58.5% antimony and 25% sulphur. From Andalusia, Spain, found with siderite.

HENWOODITE. A phospho-arsenate of copper, with occasional aluminium and iron. About 7% cupric oxide.

HERMESITE. A tetrahedrite carrying mercury.

HERRENGRUNDITE. $\text{CaO}, 4\text{CuO}, 2\text{SO}_3 + 6\text{H}_2\text{O}$. Carries 50% to 54% cupric oxide.

HOMICHLINITE. Apparently a chalcopyrite partly altered to bornite. Carries about 44% copper and 26% iron.

HORSFORDITE. An antimonide of copper, probably Cu_2Sb . Carries about 73% copper, 27% antimony. Massive. Fracture: Uneven. Brittle. Hardness: 4 to 5. Gravity: 8.8. Luster: Metallic. Color: Silver white

tarnishing easily. Opaque. Occurrence: In large deposits near Mitylene, Asia Minor.

HYDROCIANITE. Cupric sulphate. CuSO_4 . A rare sulphate from Vesuvius. Effloresces in the air.

INDIGO COPPER. Covellite.

JALPAITE. Probably $3\text{Ag}_2\text{S}$, Cu_2S , giving about 13% copper.

JOHANNITE. A hydrous sulphate of uranium and copper, of uncertain formula, carrying about 6% cupric oxide, and 67% to 68% uranic trioxide.

JULIANITE. A tetrahedrite-tennantite carrying less than 1% each of silver and iron, with about 52% of copper.

KEWEENAWITE. $(\text{CuNiCo})_3\text{As}$. Carries 39% to 54% copper, 9.7% to 20% nickel, 0.9% cobalt. An arsenide of copper, nickel and cobalt, of the mohawkite family. No crystals are known. Cleavage: Subconchoidal. Fracture: Uneven. Tenacity: Slight. Hardness: 4. Gravity: 7.7. Luster: Metallic. Opaque. Color: Pale red, tarnishing to darker red. Soluble in nitric acid. Occurrence: In the Mohawk mine, Keweenaw county, Michigan. Uses: Is smelted, in conjunction with mohawkite.

KLAPROTHOLITE. $3\text{Cu}_2\text{S}$, $2\text{Bi}_2\text{S}_3$. Carries 24% to 29% copper and 51.5% to 54% bismuth with 1% to 1.7% iron.

KROEHNKITE. CuSO_4 , NaSO_4 , $+2\text{H}_2\text{O}$. A hydrous sulphate of copper and sodium. Carries about 47% cupric oxide.

LANGITE. A basic sulphate of copper. 4CuO , SO_3 , $4\text{H}_2\text{O}$. Carries about 17% cupric oxide.

LAMPADITE. Cupreous manganese containing 4% to 18% cupric oxide.

LAUVENDULAN. A hydrous arsenate of copper, cobalt and nickel. Constituents by weight: About 32% copper, 2.5% CoO , 1.35% NiO . Amorphous. Fracture: Conchoidal. Hardness: 2.5 to 3. Gravity: 3.01. Luster: Greasy to vitreous. Color: Lavender blue. Streak: Pale lavender blue. Translucent. Soluble in warm hydrochloric acid. Occurrence: Saxony and Chile.

LAXMANNITE. Phosphochromite.

LEPIDOPHARITE. A cupreous manganese oxide of fibrous and scaly form, from Thuringia.

LETTOMITE. Cyanotrichite.

LEUCOCHALCITE. A hydrous arsenate of copper. In slender needle crystals. Color: Greenish white. Cupric oxide 47.2%.

LIBETHENITE. 4CuO , P_2O_5 , H_2O . Carries about 53% copper. Common name: Phosphate of copper. Orthorhombic. Fracture: Subconchoidal to uneven. Brittle. Hardness: 4. Gravity: 3.6 to 3.8. Luster: Resinous. Color and Streak: Olive green. Subtranslucent. Soluble in nitric acid. Occurrence: Hungary, Germany, Russia, Bolivia, Chile, Cornwall.

LIME-MALACHITE. A hydrous carbonate of copper with carbonate and sulphate of calcium.

LINARITE. A basic sulphate of copper and lead, $\text{PbO}, \text{CuO}, \text{SO}_4, \text{H}_2\text{O}$. Contains about 17% to 20% cupric oxide.

LINDACKERITE. A complex hydrous sulpho-arsenate of copper, nickel and iron; cupric oxide 36.34%, nickel monoxide 16.15%.

LINNAEITE. A sulphide of cobalt in which cobalt is sometimes partially replaced by nickel, copper and iron, to extent of 1% to 42% nickel, 2% to 6% iron and 1% to 8% copper.

LIRCONITE. Octahedral arsenate of copper. Probably $18\text{CuO}, 4\text{Al}_2\text{O}_3, 5\text{As}_2\text{O}_5 + 55\text{H}_2\text{O}$. Carries about 28.5% copper. Monoclinic; rarely granular. Cleavage: Subconchoidal. Imperfectly sectile. Hardness: 2 to 2.5. Gravity: 2.88 to 2.98. Luster: Vitreous. Color and Streak: Sky blue to verdigris green. Soluble in nitric acid. Occurrence: Cornwall and Hungary.

LUZONITE. Apparently a dimorphous form of enargite, found in the island of Luzon, P. I.

LYELLITE. An impure variety of langite, containing gypsum and iron.

MALACHITE. $2\text{CuO}, \text{CO}_2 + 2\text{H}_2\text{O}$. Green carbonate of copper, the most common carbonate. Monoclinic; acicular or prisms. Commonly massive or frequently incrustive. Sometimes granular or earthy. Fracture: Subconchoidal, uneven. Brittle. Hardness: 3.5 to 4. Gravity: 3.9 to 4.03. Luster of crystals, adamantine to vitreous. Color: Bright green. Streak: Green. Opaque to translucent. Soluble in nitric acid. Occurrence: In most copper districts. Uses: An important ore of copper in certain districts.

MALINOWSKITE. A tetrahedrite carrying 13% to 16% lead, also silver and zinc in small percentages.

MARCYLITE. An alteration product of copper sulphide, consisting of hydrated oxides and sulphides of copper. Found in Arkansas, U. S. A., and Peru.

MATRAMITE. A vanadate of lead and copper sometimes carrying also iron, zinc, manganese, magnesium and calcium oxides. From 19% to 21% cupric oxide.

MELACONITE. Tenorite.

MELANOCHALCITE. Form: Amorphous or cryptocrystalline. Color: Jet black, coffee brown powder. Luster: Vitreous. Hardness: 4. Specific gravity: 4.14. Opacity: The fine particles are translucent under high power of microscope, light passing through as yellow-brown. Chemical characters: Heated in a closed tube loses water and carbon dioxide and powder turns from coffee brown to brown black. With borax gives the sky blue color of copper. With salt of phosphorus gives a skeleton of silica in the blue glass. Is decomposed by hydrochloric acid, even a 3% solution of acid changing a fragment into a white silicious mass retaining the outlines of the original fragment, and only cupric chloride being produced. Composition: $\text{CuO}, 76.88; \text{SiO}_2, 7.80; \text{CO}_2, 7.17; \text{H}_2\text{O}, 7.71; \text{MO}, .41; \text{FeO}, .07$.

SiO₂ and CO₂ replace each other within certain limits. From this fact and the behavior of the mineral under dilute hydrochloric acid, it is deduced by Dr. Geo. A. Koenig, who identified the mineral, late in 1902, that there exists in it a compound orthoacid, H₄(Si,C)O₆, with the hydrogen replaced by copper. Viewed in this light melanochalcite represents the basic copper salt of the ortho-silico-carbonic acid, the figures of the analysis agreeing closely with the formula Cu₂(Si,C)O₄·Cu(HO)₂. Occurrence: In the Calumet & Arizona mine, Bisbee, Arizona, the mineral always surrounding cuprite as a black band and being overlaid in turn by green copper silicate and copper carbonate.

MILANTERITE. (FeCu)SO₄·7H₂O. A sulphate of iron and copper, in which the latter has partly replaced the iron. Carries 10% to 16% cupric oxide.

MIXITE. A hydrous basic arsenate of copper and bismuth, of doubtful formula. Carries about 44% cupric oxide.

MOHAWKITE. (CuNiCo)₂As₂. An arsenide of copper, nickel and cobalt. No natural crystals have been found, but artificial crystals, hexagonal, have been produced by synthesis by Dr. G. A. Koenig, the discoverer of mohawkite. Constituents by weight: Copper, 63% to 69%; nickel, 3% to 7%; cobalt, 0.5% to 2%; arsenic, about 28%, with more or less silver replacing copper. Cleavage: Indistinct. Fracture: Uneven. Tenacity: Slight. Hardness: 4. Gravity: 8.05. Color: Gray on fresh fractures, tarnishing to purple or brassy yellow. Streak: Gray. Opaque. Soluble in nitric acid. Occurrence: In a fissure vein, in considerable quantities, at the Mohawk mine, Keweenaw county, Michigan.

MOHAWK-WHITNEYITE. Cu₂As₂. Carries 83% to 87% copper. Is a mere name of convenience for an intimate blending of mohawkite and whitneyite, or keweenawite and whitneyite, rather than the name of a distinct mineral. Blending is indistinguishable to the eye, but is determined chemically. Malleable; only a little less so than copper. Cleavage: None. Fracture: Hackly. Hardness: About 5. Gravity: 8.6. Color: Gray, with yellow tinge, tarnishing to coffee brown. Streak: Gray. Opaque. Soluble in nitric acid with small residue of gray powder. Occurrence: At Mohawk mine, Keweenaw county, Michigan.

MOUNTAIN BLUE. Azurite.

MOUNTAIN GREEN. Malachite.

MYSORIN. An impure malachite from Mysore, India.

NAMAQUALITE. A hydrated oxide of copper, aluminum, manganese, calcium and silicon, with 44.75% cupric oxide. From Namaqualand, South Africa.

NANTOKITE. CuCl₂. A simple chloride of copper. Copper 84.1%, chlorine 35.9%. Isometric; granular; massive. Cleavage: Cubic. Fracture: Conchoidal. Hardness: 2 to 2.5. Gravity: 3.9. Luster: Adamantine. Colorless to grayish white. Transparent to translucent. Soluble in nitric or

hydrochloric acids and in ammonia. Gives off chlorine when struck a sharp blow. Oxydises readily on exposure to atmosphere. Occurrence: Carmen Bajo mine, Chile.

NOHLITE. A frightfully complex niobate of zirconium, uranium, yttrium, erbium, cerium, iron, calcium, manganese and copper; latter less than 1%. From a feldspar quarry in Nohl, Sweden.

OCTAHEDRAL COPPER ORE. Cuprite.

OLIVENITE. $4\text{CuO}, \text{As}_2\text{O}_5, \text{H}_2\text{O}$. Carries about 44.8% copper. Common name: Olive green copper ore. Orthorhombic; crystals prismatic, acicular; also globular and granular. Fracture: Conchoidal to uneven. Brittle. Hardness: 3. Gravity: 4.1 to 4.4. Luster: Adamantine to vitreous. Color: Olive green to blackish green. Subtransparent to opaque. Soluble in nitric acid.

ORILEYITE. Probably $(\text{Cu}, \text{Fe})_2(\text{As}, \text{Sb})_2$. A stibio-domeykite in which iron has partly replaced copper; found in Burmah.

PARAMELACONITE. Apparently a duplex oxide of copper, assaying about 85% cuprous oxide and 13% cupric oxide.

PEACOCK ORE. Bornite. Name sometimes applied to chalcopyrites showing iridescent tarnish.

PELOCONITE. A variety of cupreous manganese.

PENTLANDITE. A sulphide of iron and nickel, carrying varying amounts of copper in small percentages.

PERCYLITE. Chemical formula probably $\text{PbCuO}_2, \text{H}_2\text{Cl}_2$. Copper about 17%. Hardness: 2.5. Color and Streak: Sky blue. Occurrence: South Africa, Mexico, Chile, Bolivia.

PHILLIPITE. Formula approximately $\text{CuSo}_4, \text{Fe}_2(\text{SO}_4)_3 + 0? \text{H}_2\text{O}$. A hydrous sulphate of copper and iron.

PHILLIPSITE. Bornite.

PHOSPHOCHROMITE. A phospho-chromate of copper and lead, containing 4.57% to 7.36% cupric oxide.

PILLARITE. An aluminous chrysocolla.

PIRITAS FERROCOBRIZAS. Spanish for iron-copper sulphides.

PISANITE. $(\text{Fe}, \text{Cu})\text{SO}_4 + 7\text{H}_2\text{O}$. An iron sulphate in which part of the iron has been replaced by copper.

PLUMBOCUPRITE. Cuproplumbite.

PLUSH COPPER. Cuprite.

POLYBASITE. A sulphide of silver and antimony in which copper replaces part of the silver.

PRASINE. A varietal form of ehrlite, carrying arsenic, silica and alumina.

PSEUDOLIBETHENITE. A hydrous libethenite.

PSEUDOMALACHITE. $6\text{CuO}, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries about 56.5% copper, 21.2% phosphorous pentoxide. Color: Dark emerald green. Greatly resembles dihydrite in chemical composition and characteristics.

PSITTACINITE. A phospho-arseno-vanadate of lead, copper, zinc and iron, with occasional cobalt. About 16% to 18% cupric oxide.

PURPLE COPPER ORE. Bornite.

RABDIONITE. A hydrated oxide of iron, manganese, aluminum, copper and cobalt, with about 14% of cupric oxide.

RED GLASSY COPPER ORE. Cuprite.

REDRUTHITE. Chalcocite.

REGNOLITE. $\text{Cu}_3\text{As}_2\text{S}_{12}$. About 33% copper, also silver, iron, zinc and trace of lead. Tetrahedral crystals. Associated with sandbergerite, which it greatly resembles. Occurrence: Cajamarca, Peru.

REZBANYITE. Cupriferous cosalite. A sulphide of lead and bismuth, carrying 1.5% to 4% cupric oxide, with some silver and a trace of zinc. Occurrence: Rezbanya, Hungary.

RIONITE. A varietal form of tennantite, carrying antimony, bismuth, iron, silver and cobalt.

RUBY-COPPER. Cuprite.

RICKARDITE. A telluride of copper. Cu_6Te_8 . Probably one molecule of cuprous telluride and two molecules of cupric telluride, Cu_2Te 2CuTe . Constituents by weight: Copper, 40.51%; tellurium, 59.49%. Massive. Fracture: Irregular. Hardness: About 3.5. Gravity: 7.54. Color: Brilliant purple, rivalling bornite tarnish, even on a fresh fracture, and showing deep color when pulverized. Fusible: On charcoal. Soluble: In nitric acid. Occurrence: Good Hope mine, Vulcan, Colo., in vein of pyrite carrying native sulphur and native tellurium, rickardite occurring as lense-shaped masses rather intimately associated with masses of native tellurium, latter being of unusual size, sometimes nearly 3 inches. Identified late in 1902 by W. E. Ford. Is the first telluride of copper discovered, and shows an interesting resemblance to the selenide of copper.

SANDBERGERITE. A tennantite-tetrahedrite carrying about 2.4% iron, 7% to 8% zinc and 3% lead.

SCHWARTZITE. A tetrahedrite carrying 15% to 17% mercury, with percentages of iron and zinc.

SILICOFLUORITE. A basic hydrous sulphate of zinc, chemical formula unknown, with a small percentage of copper.

TSUGENITE. The nickeliferous variety of linnacite, sometimes carrying small percentages of copper.

SMALTITE. Empirically CoAs_2 , but always found to carry iron, nickel and copper as well as cobalt. See chloanthite for further reference to diarsenides and arsenides of copper and associated metals.

SOMERVILLITE. $\text{CuSiO}_3, 4\text{H}_2\text{O}$. Same as chrysocolla except carrying double the water.

SPANGOLITE. A highly basic sulphate of aluminum and copper. $\text{Cu}_6\text{AlClSO}_{16}, 9\text{H}_2\text{O}$. Carries about 59.5% cupric oxide.

SPANIOLITE. A tetrahedrite carrying mercury.

SPEISS. An alloy of copper with arsenic.

STANNITE. Perhaps $\text{Cu}_2\text{S}, \text{FeS}, \text{SnS}$, in which the iron is partly replaced by zinc. Carries about 29% copper, 25% tin and 23% to 29% sulphur, with iron 6% to 13.5% and zinc 1.7% to 9.7%.

STIBIODEMEYKITE. $\text{Cu}_3(\text{AsSb})$. An antimonial domeykite. No natural crystals have been found; artificial crystals made by Dr. Koenig are hexagonal. Cleavage: None. Fracture: Irregular and uneven. Tenacity: Very slight. Brittle. Hardness: 4. Gravity: 8.1. Luster: Metallic. Color: Gray, with yellow tinge, like domeykite. Streak: Gray. Opaque. Soluble in nitric acid, with small residue of gray powder. Occurrence: At Mohawk mine, Keweenaw county, Michigan.

STROMEYERITE. Sulphide of silver and copper $(\text{Ag}, \text{Cu})_2\text{S}$, carrying about 52% silver and 31% to 34% copper.

STUEBELITE. A complex silici-hydrochlorate of aluminum, iron, manganese and copper, found on the island of Lipari, Italy. As determined, carries 15.25% cupric oxide.

STUDERITE. A varietal form of tetrahedrite carrying arsenic, iron, zinc, silver, lead and bismuth, in addition to the antimony, copper and sulphur found in the nominally perfect tetrahedrite.

STYLOTYPITE. $3(\text{Cu}, \text{Ag}, \text{Fe})\text{S}, \text{Sb}_2\text{S}_3$. Copper 28.3%, antimony 31.3%, silver 8.1%, iron 7.3%, sulphur 25%. Orthorhombic. Fracture: Imperfectly conchoidal. Brittle. Hardness: 3. Gravity: 4.8. Luster: Metallic. Color: Iron black. Streak: Black. Fusibility: Decrepitates and fuses readily on charcoal. Occurrence: Copiapo, Chile.

SUB-OXIDE OF COPPER. Cuprite.

SYCHNODYMITE. Essentially $(\text{CuNiCo})_2\text{S}_3$. A compound sulphide of copper, nickel and cobalt. Carries 17% to 19% copper, 35% to 36% cobalt and 3.5% to 6% nickel.

TAGILITE. $4\text{CuO}, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries about 49% copper. Monoclinic; also spheroidal concretions with structure fibrous to earthy. Luster: Vitreous. Color: Verdigris to emerald green. Subtranslucent. Soluble in nitric acid. Occurrence: Russia and Chile.

TALLINGITE. $\text{Cu}_3(\text{OH})_2\text{Cl}_2 + 4\text{H}_2\text{O}$. Copper about 64%. A hydrated copper chloride. Sub-crystalline. Hardness: 3. Gravity: Approximately 3.5. Color: Greenish blue. Streak: White. Subtranslucent.

TENNANTITE. Gray copper ore. $\text{Cu}_3\text{As}_2\text{S}_7$. Copper 57.5%, arsenic 17%, sulphur 25%. The many varietal forms of this mineral are brought about by the replacement of copper with bismuth, lead, silver, zinc, iron.

mercury, nickel, cobalt, tin and platinum. Isometric; tetrahedral, also massive; granular, coarse or fine; compact. No cleavage. Fracture: Subconchoidal. Brittle. Hardness: 3.5 to 4.5. Gravity: 4.4 to 5.1. Luster: Metallic. Color and Streak: Flint gray to iron black. Opaque to subtranslucent in small splinters. Fusibility and Solubility: Same as tetrahedrite. Occurrence: At many points.

TENORITE. CuO . Cuprous oxide. Common names: Black copper; black oxide of copper. Copper 79.8%, oxygen 20.2%. Monoclinic; earthy; massive, pulverulent. Fracture: Conchoidal to uneven. Hardness: 3 to 4. Gravity: 5.8 to 6.25. Luster: Metallic. Color: Steel gray in flakes, dull grayish-black when massive. Soluble in nitric and hydrochloric acids. Occurrence: Italy, Tennessee, Lake Superior, etc.

TETRAHEDRITE. Gray copper ore. $\text{Cu}_2\text{Sb}_2\text{S}_7$. Greatly variable, shading into tennantite. Copper 52.1%, antimony 24.8%, sulphur 23.1%. This mineral is of protean form, frequently having a part of its copper replaced by iron, silver, mercury, zinc, lead, cobalt, nickel, tin and platinum. Isometric; tetrahedral; also massive; granular, coarse to fine; compact. No cleavage. Fracture: Subconchoidal to uneven. Brittle. Hardness: 3.5 to 4.5. Gravity: 4.4 to 5.1. Luster: Brilliant metallic. Color: Flint gray to iron black. Streak: Grayish brown to cherry red. Opaque in quantity; occasionally subtranslucent (cherry-red) in very thin splinters. Fusible on charcoal. Soluble in nitric acid. Occurrence: Cornwall, Germany, Peru, Chile, Bolivia, Arizona, Nevada, etc.

TILE ORE. A mixture of atacamite and cuprite with hematite and earthy material.

TORBERNITE. CuO , 2UO_3 , P_2O_5 , $8\text{H}_2\text{O}$. Uranium mica. A hydrous phosphate of copper and uranium, frequently carrying arsenic. Carries 8% to 9% cupric oxide and 59% to 62% uranic oxide.

TRICALCITE. $\text{Cu}_3\text{As}_2\text{O}_8 + 5\text{H}_2\text{O}$. Carries about 34% copper. In radiated groups, columnar; also in dendritic forms. Hardness: 2.5. Luster: Silky. Color: Verdigris green. Soluble in hydrochloric acid. Occurrence: Turginski mine, Russia.

TRIPPKEITE. An arsenite of copper. $?\text{CuO}$, As_2O_3 . Found in druses.

TURQUOISE. A gem stone (hydrous phosphate of aluminum) colored by 2% to 8% cupric oxide.

TYROLITE. 5CuO , As_2O_3 , $9\text{H}_2\text{O}$. Cupric oxide about 50%.

UMANGITE. A selenide of copper, formula Cu_3Se_2 . Carries 54% to 56% copper.

URANIUM MICA. Torbernite.

URANOCHALCITE. A hydrous sulphate of uranium and copper, formula undetermined, carrying about 6% to 7% cupric oxide.

VALLERITE. A mineral containing copper, sulphur, iron, alumina, magnesia and water. Color resembles pyrrhotite. Very soft. Occurrence: At Nya Kopparberg, Sweden.

VARIEGATED COPPER ORE. Bornite.

VAUQUELINITE. Phosphochromite.

VELVET COPPER ORE. Cyanotrichite.

VENERITE. A hydrous silicate of aluminum, iron (both protoxide and sesquioxide), magnesium and copper. As determined carries about 15.25% cupric oxide.

VERDIGRIS. Copper carbonate. Formed from the metal by carbon dioxide assisted by moisture in the air.

VESZELYITE. A hydrous phospho-arsenate of copper and zinc. Percentage of cupric oxide about 37.4%.

VOLBORTHITE. A hydrous vanadate of copper, barium and calcium. Cupric oxide about 38.4%.

WARRINGTONITE. A varietal form of brochantite.

WHITNEYITE. Cu_3As . About 85% copper. Massive; crystalline; granular. Malleable. Hardness: 3.5. Gravity: 8.4 to 8.6. Luster: Sub-metallic. Color: Grayish white, tarnishing to bronze or brownish black. Slightly iridescent. Opaque. Soluble in nitric acid. Occurrence: Houghton county, Lake Superior, Sonora, Mexico, and Chile.

WINKLERITE. A highly complex hydrated carbo-oxy-arsenate of copper, cobalt, nickel and calcium, from Almeria, Spain; carrying about 15% in cupric oxide.

WOOD COPPER. Olivenite.

WITTICHENITE. Cu_3BiS_4 . Copper 38.4%, bismuth 42.1%, sulphur 19.5%. Orthorhombic, massive and disseminated, also coarse columnar. Fracture: Conchoidal. Hardness: 3.5. Gravity: 5. Color: Steel gray to tin-white, tarnishing to pale lead gray. Streak: Black. Decomposes easily on charcoal. Soluble in nitric or hydrochloric acids. Occurrence: At Wittichen, Baden, Germany.

WOLFSBERGITE. Chalcostibite.

WOODWARDITE. A complex sulphate of copper and aluminum, carrying 47% to 49% cupric oxide and 13% to 19% aluminum sesquioxide.

YPOLEIME. $5\text{CuO} \cdot 2\text{P}_2\text{O}_5 + 5\text{H}_2\text{O}$. A hydrous phosphate of copper of the pseudomalachite series.

ZEUNERITE. An arsenate of copper and uranium corresponding to the phosphate torbernite. Carries about 7.5% cupric oxide.

ZINKAZURITE. A mineral from the Sierra Almagrera, Spain. Essentially a hydrous sulphocarbonate of zinc and copper.

ZINKENITE. A sulphide of lead and antimony in which copper or silver sometimes replaces lead to a trifling extent.

ZIPPEITE. A hydrous sulphate of uranium and copper, carrying about 5% cupric oxide.

ZORGITE. A selenide of copper and lead, formula variable, giving 4% to 15.5% copper and 41% to 60% lead, with traces of silver, iron and mercury.

CHAPTER IV.

METALLURGY OF COPPER.

Upon this topic many volumes have been written, all of more or less value, some few dealing with the entire subject, while the majority treat of a portion only. It is manifestly impossible to thoroughly cover the entire metallurgy of copper in the limits of a single chapter, yet I have attempted, conscientiously, to review the subject, briefly but fairly, giving to each topic its just proportion of attention, and to set forth in this chapter a very short but connected and logical account of the principal features of the various processes of copper reduction. To those desirous of going deeply into the matter I can but advise careful perusal of the works of Peters, Eissler, Douglas, and others who have written exhaustively of the various branches of the reduction and smelting of copper.

The metallurgy of copper is divisible into three principal groups, these being pyro-metallurgy, hydro-metallurgy and electro-metallurgy—the three kingdoms of fire, water and electricity. All are more or less closely related and interdependent. Copper secured by the various wet processes must be refined by fire or electrolysis, or possibly both. The production of commercial copper by heat alone is possible, and fire is the sole element used in the purification of the native copper of the Lake Superior district. Electrolysis refining is in general use for refining crude coppers containing high values in gold and silver, and for freeing the metal from more deleterious elements.

A brief glance at the history of copper production may not be out of place. The smelting of copper must have begun at an early date, as copper and bronze have been found in tombs and disinterred cities of very great age. The copper must have been smelted, because the ancients possessed no mines of the native metal. The process of smelting was never lost and was handed down from generation to generation, from Egyptian through Roman to modern times. One of the Swansea smelters dates back from the Sixteenth century and was preceded by others of which there is little or no record. The Welsh and English were the first to engage in copper smelting as an independent industry, the practice from time immemorial having been to smelt the ore at or near the mines. As a result of the establishment of independent works that bought ore from many mines, the Welsh smelters progressed more rapidly in metallurgical knowledge than their competitors and gained great skill in handling refractory ores. As a consequence Swansea became the seat of the greatest diversified smelting

industry on the globe, and the location of the city being favorable for the receipt of ore and matte consigned from foreign countries, the industry has flourished for several centuries, but of late years has declined in importance, owing partly to the tendency toward refining ores as near as possible to the mines, which is but a recurrence to the ancient practice. The decadence of the Welsh smelting industry has also been aided, beyond doubt, by the arbitrary restrictions placed on shippers until very recently.

The Swansea smelters at the height of their prosperity drove hard bargains with producers. For a ton, 21 hundredweights were demanded, and received. An allowance of $3\frac{1}{2}$ pounds on 3 hundredweights was exacted for "draftage." Allowances were also claimed for moisture. No new smelters have been built at Swansea since 1867, though perhaps 75 per cent. of the world's copper output was smelted there at a period about the middle of the Nineteenth century. The Welsh port still continues as the most important independent smelting point of the world, but, for the reason that the reduction of ores can now be accomplished more cheaply near the mines in most cases, can never regain its lost prestige in the copper trade.

The first smelters in the United States were probably primitive affairs, of small capacity, built late in the Eighteenth century, but the first American smelter of which there is an authentic record was blown in at Taineston, Maine, in 1836. The first successful American smelter was built at Baltimore in 1845, and became the nucleus of what is now one of the most important metallurgical plants of the United States. A year or two later a small smelter was built at New Haven, and from this primitive plant dates the great copper and brass manufacturing industry of the Naugatuck Valley of Connecticut. At about the same period a smelter was erected at Bergen Point, New Jersey, the precursor of the present vast works at Perth Amboy and other points on the Jersey shore. A smelter was erected at Pittsburg in 1848, and about 1850, smelting plants were built at Cleveland, Detroit, and Hancock. Smelters were built at Ducktown, Tennessee, in 1854, and since that time the process of the copper smelting industry in the United States has been steady.

In Europe there were copper smelters at very early periods in Germany, Sweden, Austria and elsewhere. At the beginning of the Eighteenth century in addition to an already extensive copper industry in Wales, there were smelters at two points in Cornwall, also in Yorkshire, Lancashire and Staffordshire, the last named works remaining in operation until 1890. There were also smelters near the principal mining centers of Germany, Austria, Hungary, Sweden, Norway, Italy, France and Russia, while in Japan and China primitive smelting operations were carried on at a number of points, and it is certain, though lacking detailed accounts, that copper was being mined and smelted, in a small way, in India, Persia, and other partially civilized countries. Copper was also secured to some small extent from the refining of the cupriferous silver ores of Bolivia, Chile and Mexico.

With the opening of many new mines during the fourth and fifth dec-

ades of the Nineteenth century, when Lake Superior, Chile, South Africa and Australia became prominent as producers; smelters, usually of crude pattern, were built at and near the mines, in many of the newer districts. The smelting of copper has now become a world-wide industry, and few of the leading copper producing countries are without large and well-managed works. The margin of profit is now so small, and the cost of transportation so great, that the larger producers are forced to produce at least the cruder forms of copper, ranging from matte to blister copper, at the mines, or near them.

Before treating of the various smelting processes, reference may be made to the impurities found in copper, with which the smelter must contend in his efforts to secure a product of good commercial quality. These impurities vary greatly in number and extent, in the ores of various districts.

Bismuth is the worst enemy of copper, and its most insidious foe. It is eliminated with difficulty, and one-fiftieth of one per cent. will cause red-shortness, while one-twentieth of one per cent. will cause cold-shortness. Bismuthiferous ores of copper are rarely smelted, except when carrying large quantities of silver, but bismuth is frequently found in ores where it apparently has no business appearing.

Arsenic, like iron, is found in nearly all brands of commercial copper. It slightly diminishes electrical conductivity, but under one per cent. does not seem to affect ductility.

Lead, next to bismuth and arsenic, is the worst impurity in copper. One-half of one per cent. will make the metal cold-short, and one per cent. will ruin copper for all purposes except casting, for which use the lead is a positive advantage, as it prevents the porosity so frequently found in cast copper.

Antimony, like iron and arsenic, exists in most commercial copper, but is usually found in small percentages. It lowers electrical conductivity, but under one-half per cent. does not seem to affect ductility.

Sulphur, frequently found in excess in poorly refined copper, reduces conductivity and ductility when present to the extent of one-fourth per cent., and one-half per cent. causes cold-shortness.

Zinc forms an alloy with copper, and in considerable quantities lessens ductility, but does not greatly affect electrical conductivity. Zinc is greatly disliked by copper smelters, and a penalty is charged for smelting ores high in this element. Many otherwise promising copper deposits are unworked because of the excess of zinc, which is eliminated with difficulty. In this connection attention is directed to the successful work being done at the Pride of the West mine, in Arizona, where copper and zinc ores are secured separately by successive concentrations.

Tin, in small quantities, does no particular damage, but materially lessens ductility when present to the extent of one per cent. or more.

Iron is found in practically all copper, except that which is chemically pure, in quantities ranging from a trace up to appreciable percentages. It

seems to form an alloy with the copper, and while reducing conductivity does not injure the copper otherwise, unless existing in unusual quantities.

Nickel, in small percentages, is a common impurity. It has apparently about the same effect as iron, to which it is related, and beyond a slight reduction in conductivity has no apparent bad effect.

Silicon, even in fractional percentages, causes a marked decrease in electrical conductivity, but up to 2 per cent. does not affect ductility. Three per cent. causes brittleness, and above 5 per cent. the metal is rendered too brittle for any ordinary use.

Phosphorus, in the minute quantities usually found in copper, has no particularly bad effect, but one-half of one per cent. will cause red-shortness.

Tellurium, even in minute quantities, produces red-shortness and cold-shortness, though not greatly affecting conductivity or ductility.

Carbon, in the form of carbon dioxide, may be absorbed by copper at a critical pitch of the metal, and produces porosity, though apparently having no other effect. This, or other gases, absorbed by the copper when in a molten state, are let out as the metal sets, thus producing a more or less porous structure.

A peculiar feature of cuprous oxide is that it will melt, at red heat, without decomposition, and frequently becomes a component of the refined metal. Cupric oxide, in small quantities, has no apparent effect on the metal, but in quantities of one-half per cent. or more lowers ductility, though not injuring the metal in other respects, even if present in quantities up to ten per cent.

In the various processes of smelting, a variety of semi-metallic compounds are formed before the metal itself is produced. The first product of fusion is known as matte, or regulus. It is difficult to define copper matte, because it may contain greatly varying proportions of any of its elements, and a considerable variety of elements, of which copper and sulphur are necessary, while iron, arsenic, and a long list of impurities, valuable and damaging, are found in greater or less number and percentages in various mattes. Matte may contain as little as 15 per cent. of copper, or as much as 70 per cent., though usually ranging from 25 or 30 per cent. in the lower grades up to 50 or 55 per cent. in the higher. The tendency of modern practice is away from the old plan of blowing up the matte to blister copper by easy stages. In the most modern plants the matte is blown up to blister copper in two or three fusions from the calcined ore. Copper matte is variously considered as an alloy, a chemical compound, or a mechanical mixture. It is obviously a semi-metallic product, possessing certain of the characteristics of metal, such as malleability, which is quite marked in the case of some high-grade mattes.

Blue metal is a high-grade matte, carrying 60 to 65 per cent. copper. White metal is a matte running 70 to 75 per cent. copper, and pimple metal carries 80 to 85 per cent. copper. Black copper is impure metallic copper carrying 1 to 5 per cent. sulphur, besides sundry metals and metalloids

as impurities. The name comes from the oxidization of the surface to a dull black. Blister copper is the highest grade of unrefined metal, carrying 96 to 99.5 per cent. copper, with one per cent. or less of sulphur, besides varying impurities. Its name comes from the blebs or vesicles in which the bubbles of gas from sulphur and other volatile elements are retained, as the copper hardens. Blister copper looks well, and is suitable for many uses, but is nearly always red-short, though not cold-short. It naturally varies considerably, the purer grades being practically a good quality commercial copper.

Cement copper is a reddish precipitate, composed of metallic copper and sundry impurities, requiring reduction and refining before use, being usually brought to blister copper, then refined. Copper bottoms are alloys of metallic copper and metals existing in the matte as impurities, formed in matting. Their formation leaves the matte purer, and the bottoms are resmelted and refined.

Finished copper is put out under many different names and brands. The principal English brands are "best selected," for brass foundries; "tough copper," for wire and sheets, and "tile," which is brittle, and suited for castings only. "G. M. B." means "good merchantable brands," and is sometimes stretched and sometimes contracted in meaning, according to whether buyers or sellers hold the whip-hand. "Chile bars," are bars of blister copper from Chilean smelters, ranging from 95 to 99 per cent. pure, and are refined before use. The principal American grades are "Lake," a very tough and ductile copper from the Lake Superior native copper mines; "electrolytic," produced by electrolysis from blister copper; "standard," which means almost anything that is neither very good nor very bad, and "casting," which, as its name implies, is suitable for castings only. The metal is turned out in a variety of forms, as ingots, molds, cakes, wire-bars, anode bars, etc., according to the particular use for which the copper is destined.

As most copper ores occur disseminated through gangue-rock, the first process of conversion into metal is one of concentration. By crushing the disseminated ore and worthless gangue, the ore, by reason of its greater specific gravity, can be separated from the gangue to a considerable extent. There are many variations, according to local conditions, but in the main the process of concentration is identical. The heavy ore is first reduced to smaller size, then concentrated by gravity, with the aid of water and jigging. Hand-picking is sometimes resorted to, and there is a dry process concentrator, in which air is used instead of water, this being suitable for districts where water is scarce and expensive. The first crushing is usually done with jaw-crushers. Gyratory crushers are sometimes used, and give good work. copper ores not being so liable to sliming as softer ores, such as galena. The next process of reduction is usually to pass the crushed ore through trains of Cornish rolls, for further reduction. Occasionally smaller jaw crushers are used, and sometimes rolls are used exclusively for crushing.

After reduction to desired size the ore is passed over jigs. These are of many patterns, but the essential principals are the same in all, the lighter gangue being driven off by a combination of movement in the jig and the force of running water, the vibration and water jets being so regulated as to permit the ore to remain while worthless rock is washed away. No matter how carefully this work is done, a little ore is lost, and a little rock remains with the concentrated ore. In modern mills the "fines," or very small particles of crushed rock and ore, are passed over patent concentrating tables, or the old style round-tables, for the saving of the very minute particles.

In the Lake Superior district, where copper is found native, the processes of concentration and smelting differ slightly from those used elsewhere. The metal sometimes occurs as masses weighing from a few pounds up to hundreds of tons. The larger masses are cut underground, with long-handled chisels, to sizes that can be hoisted, and when on the surface are hand-cobbed to separate as much as possible of the adhering gangue, then put directly into the furnaces for smelting. The smaller masses are cobbed under steam-hammers, and also sent direct to the smelter. The bulk of the ore occurs as disseminated particles of small size, scattered through amygdaloid or conglomerate rock, in quantities from one-half of one per cent. to 10 per cent. This rock is hoisted to the surface as broken, put through one or two crushers in a rock-house which is part of the shaft-house, sorted by passing over grizzlies, then dumped direct into hopper cars and carried to the mill. Ore from the cars is dumped into bins at the top of the mill, thence fed by gravity under the stamps, which are very powerful, and actuated by steam, the feed being regulated by an experienced workman in charge. Such stamps, of the most modern design, crush 400 to 550 tons each, per working day of 20 hours, the rock being exceedingly refractory. From the stamps the crushed rock is fed to jigs, a portion of heavy copper being secured direct from the mortar boxes. The jigs are in series, taking coarse and fine sands from the stamps. A portion of the coarse sands discharged as tailings are recrushed and rejigged. The fines, or slimes, are passed over slime-tables of various patterns, those in principal use being the old-style Evans round-table, sometimes with two or three decks to save floor space, and the Wilfley and Overstrom patent tables, whereon concentration of fine metallic particles is effected by a combination of oscillatory motion, water jets, and parallel ridges on the bed of the table. The waste sands are washed away by strong currents of water, and piled some distance from the mill, while the concentrated metal with its adhering gangue-rock called "mineral," is taken to the smelters for reduction. The former practice of dressing this mineral to a high percentage of metallic contents is giving way to an opposite course, all of the Lake mills now dressing their mineral to much lower grades than formerly, it having been found that the cost of smelting mineral, which is about \$5 to \$7 per ton, renders it more profitable to fuse the extra gangue-rock than to lose the large amount of fine copper

formerly going away in the slime sands. The mineral produced by the Lake mills now ranges from 50 to 85 per cent. metallic copper. Many of the big mills make several different grades of mineral, varying in richness as well as in size of the nodules of metal. There is more or less hand-picking of the coarser grades of mineral for particles of silver, and a small percentage of the refined copper turned out is treated electrolytically, to save the silver that would otherwise be lost. The Lake copper carries no gold.

The smelting of Lake copper is done in blast furnaces, often of considerable size. The crude mineral is charged in the furnaces with fuel, usually anthracite coal, though coke is used at a pinch, and limestone for flux. The product of the first fusion comes as impure copper and cupreous slags, the latter being resmelted. The crude copper is refined by a successive smelting. The refined copper always contains more or less silver, with traces of iron, arsenic, etc. Commercial brands of Lake copper are always less pure, chemically than high-grade electrolytic copper, but the Lake product possesses superior ductility and is especially desirable for wire-drawing and similar uses.

The great bulk of the world's copper supply comes from sulphide ores. While leaching processes are employed at many mines, the greater part of the sulphide ores is reduced by heat alone, and in such cases it is desirable that as much as possible of the sulphur be eliminated before the ore goes to the smelter, unless the system of pyritic smelting be employed. To accomplish the partial oxidation of the sulphur in sulphide ores, such ores are given a preliminary roasting or calcination. This may be accomplished by heap-roasting in open air, or by roasting in stall, shaft or kiln furnaces. Heap-roasting on a large scale causes the destruction of vegetation for several miles away, because of the fumes of sulphurous and sulphuric acid driven off.

The processes of heap-roasting, while identical in the main, differ greatly in almost every detail of practice. It is perhaps applied most successfully at the Rio Tinto mine, where the heaps are of enormous size, and are burned with a marvelously small amount of carbonaceous fuel. At this mine hand-selected rich ores, averaging 8 to 10 per cent. copper, are piled in heaps of about 400 tons, and fired with a single cord of wood, such heaps burning 6 to 9 months each. The time ordinarily required for roasting an average heap is 30 to 90 days, 60 days being perhaps a fair average. The ground for a roast-heap cannot be prepared with too much care. Allowance should be made for sufficient slope to provide good drainage, and ditches should be dug to carry off rain water, and also to divert the drainage of adjacent ground, as a large proportion of the metallic values may be leached out by water in a short time. The ground is usually surfaced with broken rock or slag, and given a final top-dressing of clay, well rolled or pounded. Above this should be placed a layer of fines, three to six inches deep, to prevent baking of clay and its inclusion with the roasted ores, when the latter are removed. On this surface of fines the roast-heap proper is built. There

is a first layer of wood, much or little according to the nature of the ores, and usually more than is really needed. The worst wood available will do very well, if care is taken to furnish a little good wood for kindling the fire. Channels are provided, so that after the wood has burned out there is draught through the heap. Chimneys of boards are built at various points, the number of channels and chimneys depending on the size of the heap. In American practice a cord of wood is used for an average of 30 to 50 tons of ore, the percentage of fuel growing less as the size of the heap is increased. The first layer of ore is of coarse lumps, 2 to 6 inches in size, or even larger, surmounted by a layer of "ragging," or medium-sized lumps, and topped with a layer of fines. The greater the percentage of sulphur, the lower the height of the pile. The shape of the heap on the ground may be square or oblong, usually the latter, to facilitate upbuilding and removal. In a roast yard it is necessary to have a considerable number of heaps, so that the process may be continuous. The heap is fired, after building, and the wood gradually kindles the sulphur in the ore which continues to burn for many weeks. The success or failure of the process depends mainly upon careful handling, the heap requiring a small but steady supply of air, for even roasting. Too much air allowed to enter the heap will result in matting part of the ore. Heap-roasting requires a great deal of hand-labor, and has various objectionable features, which restrict its use.

Ores are also roasted in kilns and in stall and shaft furnaces. A stall furnace is merely a perfected form of heap-roasting, wherein brick, stone or slag-block walls are built about the roast-heaps, regulating the air currents. At times a cover is built above, thus preventing the access of rain-water, which would quickly leach out a large part of the copper values. In the most modern forms of stalls, paved or grated floors are added, and stalls grade into furnaces by the addition of flues and chimneys for the carrying off of the roast-gases.

The fumes of sulphur from roast-heaps are very objectionable, and also wasteful. Such fumes can be kept from the air and utilized in the making of sulphuric acid, by passing through lead-lined acid chambers, in which the acid fumes are taken into solution by water. Shaft-furnaces are especially used where the fumes are saved for the manufacture of acid. The Gerstenhoefer is perhaps the best-known form of shaft furnace. This consists of a vertical shaft with a mechanical device for feeding the charge from above, and the fresh, pulverized ore, is intercepted in its downward progress by projecting ledges, thus permitting its partial oxidation. Kiln-roasting is also employed where sulphurous fumes are saved for acid making, the kilns being of shaft-like form. This process has the advantage of permitting a much more complete desulphurization than is possible in heap or stall-roasting. Matte is sometimes heap-roasted, requiring several successive burnings. The practice is of doubtful utility, unless in exceptional cases.

The roasting of sulphide copper ores may be reducing or merely oxidiz-

ing in nature. The calcination of copper ores is an apparently simple process but in practice requires nice discrimination and great care to secure the best results, owing to the varying proportions of copper, sulphur, iron and other elements found in the raw ores. The skill and care with which the calcining is done greatly affect the costs and success of the future processes of reduction. As the combinations of ores and requirements are almost innumerable, the practice in one district is usually more or less different from that of another, and even mines in the same district do not always perform their calcining in a precisely similar manner. Securing the best possible results in each case calls for individual treatment by a metallurgist skilled in practice as well as in theory—and more especially one skilled in practice.

Calcining may be performed in hand furnaces, but automatic devices are more economical, and are in general use in all but the smallest and least modern works. Hand reverberatory furnaces with a hearth heated by a fireplace separated from the furnace by a bridge-wall with side openings, give as good satisfaction as can be secured with hand furnaces. Muffle furnaces are sometimes used. These give a very equable heat, but are expensive in operation and not generally used. There are various forms of cylinder calciners, among the best of which is the Douglas muffle cylinder calciner, with continuous discharge. This has a central flue of tile, which takes combustion products direct to the chimney. This is suited for general work, but is especially adapted for the economical and cleanly saving of sulphurous fumes for the making of acid. Hand-power cylinders are occasionally found in use, but are as expensive and wasteful as hand-power apparatus of any sort, where mechanical means can be found for doing the work. The Brueckner automatic intermittent discharge cylinder has a greater diameter and shorter length than other varieties of cylinders, and is in more general use than the other varieties, as it takes less floor space and is automatic and efficient in operation.

The principal form of calciner is the automatic reverberatory, of which there are a number of patented varieties, all of more or less value. These consist essentially of stationary reverberatory furnaces, through which plows are dragged to rabble the calcining and remove the calcined ore. One of the best forms is the turret furnace, in which horizontal revolving plows are actuated from a central shaft, while the ore charge is fed automatically from hoppers above. The turret furnace is economical of floor space and attendance, and may be built double or triple decked, if desired. In calcining ores a certain amount of copper is volatilized, and carried off with the roast gases, but in all modern plants such copper is saved in dust chambers, where it is deposited and whence it is afterward removed and smelted. As flue dust is usually high in arsenic and antimony, volatile elements that are highly deleterious to finished copper, flue dust is commonly smelted by itself, though sometimes mixed with matte.

The fuels used in smelting copper are of considerable variety, and depend

somewhat upon availability and price, as well as local requirements. Anthracite and bituminous coal, coke and charcoal are used. Coke is in most general use, while charcoal is usually obtainable at more remote points only. Anthracite coal is a very good fuel for most purposes, but unobtainable at reasonable prices in the majority of districts, while bituminous coal is the most objectionable fuel, and, next to charcoal, the least used, though there is such a great difference in the nature of soft coal that some varieties work well in partial or complete fuel charges, while others give most abominable results. Gas is also used at a few points, and seems suited for reverberatory furnace work. There seems no good reason why petroleum, properly sprayed, should not serve the same purpose. The nature of a charge placed in a furnace necessarily depends, first, upon the available ores, and secondly, upon the nature of the principal ores requiring smelting. In practice it is desirable to blend various copper ores, where the necessary grades can be secured, rather than to add barren fluxes, but this is, of course, a matter depending upon the availability of the ores desired. One of the secrets of the success of the big custom smelters is found in their ability to mix various ores from different districts so as to lessen or entirely eliminate the use of barren limestone or iron ore for fluxing. The use of "sweeteners" is to be commended, where such ores are obtainable at reasonable prices. Ferruginous ores are required for mixture with silicious ores. Local conditions regulate practice, and the soundest theories must often step aside in the presence of prohibitory freight rates; and high freight rates are common in many of the greatest copper producing districts of the world.

Furnaces for the smelting of copper ore are of two classes, the blast furnace, which has a powerfully reducing atmosphere, and the reverberatory furnace, where a reflected flame gives a neutral atmosphere. The blast furnace is a device so ancient that the date of its invention is unknown. In its crudest form it is but an oven in which ore and fuel are placed together and air pumped in to aid in reduction. The modern improvements on the blast furnace have been in the direction of enlarged capacity and details, the central plan remaining the same as a thousand years ago. There were blast furnaces for the reduction of copper ores in existence in very early days at Eisleben, Germany; at Roros, Norway; in Atvidaberg, Sweden; at Perm, Russia, and in other parts of Europe. The development of the blast furnace to the present day size and efficiency has been accomplished by a steady succession of little improvements, covering many centuries, rather than by single strides, yet it may be said that blast furnace smelting has been improved more in the past thirty years than in the preceding five centuries.

The smelting of copper ore in a blast furnace is the process of reducing the metal from its ores or gangues by the use of carbonaceous fuel, usually coke, in an oven having a blast of air, which may be drawn direct from the atmosphere, or heated before passing through the tuyeres. This process is adapted to the reduction of practically all of the copper ores. In addition

to the charge of ore, fuel and fluxing elements are added, the flux being cupriferous or barren, as circumstances may dictate. One of the greatest improvements of modern days in blast furnace practice has been the invention of the water-jacket. This was devised at the Longfellow mine, Arizona, in 1874. The smelter was 800 miles from a railroad, fire-brick cost one dollar each, and were of short life, the ore being highly basic. As it was manifestly impossible to make enough copper to pay for the furnace linings, the experiment was tried of using iron sides for the furnace, with hollow walls, through which water was circulated. This proved a success, and is now in very general use, water-jacketed cupolas being far more common at present than those with fire-brick linings. Despite the considerable loss of heat resulting from the circulation of water between the inner and outer shells, the water-jacketed cupola has proved itself both efficient and economical. Such furnaces are now built with daily capacities of 200 to 300 tons. The shells are usually circular or oval, with jackets of cast-iron, wrought-iron or soft steel, and copper is frequently used.

Reverberatory furnaces are a Welch invention, dating only from the last quarter of the Nineteenth century, and after running the gauntlet of conservatism have so effectually proven their value that their utility is no longer questioned. Reverberatory furnaces are adapted to all classes of ore, but are more especially suited for the reduction of sulphides, for which purpose they unquestionably lead the old-style blast-furnace. In the reverberatory furnace the flames from a lower grate, on which the fuel is fired, are reflected back upon the ore charge, lying on a bed above, thus giving a neutral atmosphere. The fore-hearth is brick-lined and movable, and the air entering the furnace is frequently preheated. In the best practice five to seven tons of ore are smelted per ton of fuel consumed, the larger furnaces giving the higher duty. Furnaces of this pattern having a daily capacity of 250 tons are not uncommon, and even larger have been built and operated successfully. In the case of sulphide ores it seems certain that reverberatory furnaces produce a richer matte from similar charges than do blast furnaces.

In the case of oxide and carbonate ores, the smelting is done in the same manner as previously described in the treatment of the native copper of Lake Superior. With the sulphide ores the process differs. The raw ore is roasted, or more frequently calcined, before charging in the furnaces, commonly of the reverberatory type. Under the influence of the reverberatory blast chemical reactions are set up that lead to the volatilization of a considerable portion of the sulphur, also part of the other volatile elements, such as arsenic, etc. The product of the first fusion is secured as a low-grade matte. If the charge is blown up to more than 50 per cent. at the first smelting the slags will probably show too much copper, entailing direct losses or resmelting. The old practice was to bring the low-grade matte from the first fusion up to blister copper by successive smeltings, in easy stages, but the modern practice is to bring the matte to high grade by as

few fusings as possible, and the former heavy losses in slags have been minimized by close attention to details.

The "direct method" of copper refining consists essentially of the fusion of a mixture of raw and calcined matte of about white metal grade, the resultant product being blister copper.

The "reactor process," for which much is claimed, and from which much is hoped, is a patented system for the production of blister copper from mattes of all grades by a single fusion. The essential features of the process are the mixture of superheated steam and fine sand with atmospheric air, which mixture is drawn into the furnace through two or more sets of tuyeres, striking the surface of the molten charge and setting up a circular motion therein, which keeps the matte free from slag, and exerts both an oxidizing and a scorifying process simultaneously. It is claimed that gold values present in the charge will be precipitated in the first matte, and that matte ranging in tenor as low as 15 per cent. can be brought up to blister copper at a single fusion, in a very short time, and that the blister copper so obtained will range above 99 per cent. in tenor, and prove remarkably free from the impurities present in the matte, which, normally, would be expected to appear in considerable quantities in the finished product. It is evident that the inventors of this process have a wide field before them, if their claims can be fully substantiated in furnace practice.

The process of conversion first applied to steel making by Bessemer, and now in general use in the manufacture of steel, was eventually applied to copper smelting, after no little unsuccessful experimenting. The first successful plant for the bessemerizing of copper matte was built in Lyons, France, in 1881, by Pierre Manhes. This process was adopted shortly afterward at the Parrot mine, Montana, where it was greatly improved over the French practice, and from that time its general adoption for the conversion of matte into blister copper may be said to date. The process, as now in general use, consists of burning out the sulphur and allied impurities in the converters, some of which are of very great capacity, having been built as large as eighteen tons. This process is completed in one heat, and the sulphur in the matte is made to work its own destruction under the influence of the blast. The process is an economical one, but should be followed by electrolytic refining to give a pure copper of high conductivity and also to save the precious metals usually contained in blister copper.

The first converters were made of one ton capacity, but now rarely run less than ten to fifteen tons in size, in the modern smelters. The crude copper is run from the furnace into the converter in some cases, thus saving re-heating. Owing to the greater specific gravity of gold and silver the precious metals tend toward the bottom of the converter, and can be saved to some extent therefrom, but this process is so crude and wasteful that the gold and silver are now generally parted by electrolysis in a later operation.

Converters are built of steel, in various sizes, sometimes of great ca-

capacity, up to 15 or 18 tons. The boiler-plate shell is made in three parts, strongly bolted together on the flanged parts, and is lined with fire-brick, or, more often, tamped gannister, cemented with clay. In the best arranged plants the copper is run direct from the cupola well of the melting furnace into the converters, thus saving loss of heat. A blast of five to fifteen pounds per square inch, furnished by an air compressor, is then blown through the molten charge, the converter blowing off into hoods that connect with flues running to the dust chamber. The number and size of the tuyeres through which the blast enters the retort vary with the style and size of the converter, which is mounted on trunnions, and provided with mechanical power for tilting. More or less copper, volatilized by the blast, is driven off, but saved in the dust-chambers, and resmelted as flue dust. In the best practice ten to fifteen-ton converters handle full charges and turn out finished blister copper of better than 99 per cent., in one to one and a quarter hours.

Pyritic smelting is a process of reduction in which the sulphur in the ore, itself a valuable fuel, is made to work its own destruction. In ordinary smelting practice the sulphur must be driven off, with great labor and trouble, through the employment of carbonaceous fuel. This process is, of course, adapted solely to sulphide ores, and apparently to only a portion of these, as sufficient silica is required to hold the iron in slag. Whether silicious ores might not be added to sulphides deficient in silica is a matter for experiment. In practice it is usually found advisable to use a little coke to start the process of combustion, but this merely serves as kindling, the real fuel being the sulphur in the ore itself, which unites with oxygen entering the furnace and passes off as sulphurous fumes, the iron in the ore also being partially oxidized at the same time. Sulphide ores occasionally require the addition of oxide ores to serve as a fluxing agent. The first cost of a pyritic smelting plant is less than that of an ordinary smelter of the common type, and, as fuel is the greatest single item of cost in the operation of a copper smelter, the cost of operation is materially lower in pyritic smelting than with any other process. The cost of calcining is saved, and the fuel bill is reduced from 60 to 90 per cent. The atmosphere is neutral, and impurities are eliminated more readily than in other smelting. It seems the coming process for such ores as it is adapted to, but it must not be thought, from the manifest advantages of the system, that it will do for all sulphide ore properties. Its adoption should not be decided on in the case of a new mine until the best expert advice has been had, and careful consideration given to every possible factor in the case.

Pyritic furnaces are charged in two ways. In layer charging the raw crushed ore is intimately blended with a small proportion of coke, and fed into the top of the furnace, there being gradual heating until the ignition of the entire mass. A low-pressure blast is used, resulting in partially roasting the ore before it reaches the smelting point. In column charging the raw crushed ore is fed into the smelting zone of the furnace, and a strong

hot-blast aids in the process, exercising a bessemerizing effect. When properly operated a furnace worked with a column charging gives matte of good grade, with exceptionally clean slags, has a large capacity and effects a big saving in fuel.

The scoria, or worthless waste material from a smelter, accumulates in large quantities, and its disposal is a matter of importance. Various plans are in use for handling and disposing of the slags. The simplest is to let it run outside and care for itself, but this is possible only where there is a sharp incline and plenty of waste room, conditions usually lacking. The cheapest plan is, probably, to granulate the slag. This is done by running the molten slag into a trough conveying a stream of running water. The slag granulates instantly and is washed away by the water, and deposited by gravity at whatever point desired. It may also be taken out in slag-pots, by hand, horse or mechanical power, or may be run out in gutters, while liquid. One valuable use of this material is the making of slag brick, which, while not suited to general use, are frequently available about a smelter. The chemical composition and physical properties of slag vary greatly, according to the nature of the ores and fluxes used in the smelter charges, but most slags are rich in iron and silica, and make excellent brick for certain rough uses. Whether cement might be made from copper slags is undetermined. The Illinois Steel Company makes an excellent cement from its iron slags, but the excess of iron in copper slags might impair the setting qualities of a cement made therefrom.

The hydro-metallurgy of copper is a special branch of the art, and one which has reached its highest development on the Iberian peninsula, where its use has resulted in the development of several very large mines, which, without its aid, could not be worked at a profit. The use of leaching processes implies a final blowing up of the product in a blast furnace, but in the main the work is accomplished by heap-roasting, leaching and cementation, in the case of sulphide ores. Lixiviation is especially adapted to sulphide ores of low grade, but it is not every low grade ore that can be handled advantageously by leaching, as it is not adapted to ores containing considerable quantities of the ferrous oxide, manganese or lime. The leaner oxides and disseminated sulphides having quartz gangues are especially suited to lixiviation. The great disadvantage of the process is that it is very slow, and locks up enormous quantities of ore, which means a heavy investment in unavailable ores and partly finished products, at all times.

The leaching processes vary, according to the nature of the ores, and in minor details, but may be broadly divided into three groups, one for oxide ores, one for sulphides, and one for sulphates, the latter receiving the same treatment whether produced naturally or artificially. In the case of old copper openings, the waters percolating through the sulphide ores gradually leach out the metal, which is carried in solution as sulphate of copper, and can be easily precipitated upon scrap iron. The mines of the Sierra Morena, in Spain and Portugal, have been worked intermittently for at least three

thousand years, and immense piles of low-grade sulphide ores and refuse have accumulated. As these weathered, the natural lixiviation was perfected, and all that is needed to save the copper is to deposit scrap iron in the path of the leach water. Upon the iron the red metal is deposited, while the iron is gradually consumed, and turned into copperas by the free sulphuric acid set free from the leach-water. The process of securing copper from sulphate solutions is now used at many old mines, resulting in small annual production, and is employed in certain districts for saving copper from water pumped out of the mines.

The process of natural cementation is well exemplified at the San Domingos mine, Portugal. The low-grade sulphide ore is cobbled to three or four-inch size, and piled in immense heaps, 15 to 40 feet in height, which are provided with valleys for drainage, with brick chimneys at intervals. Pipes are laid over the surface of the heap, and water applied copiously at intervals. The water draining out of the heap is collected in sluices, and the metal carried in solution as copper sulphate is precipitated in metallic form on scrap iron. Such heaps may contain a million tons of ore, and require eight or ten years for leaching.

What is called artificial cementation is best exemplified at the Rio Tinto mine, in Spain. Broken ore is piled in roast-heaps, called *teleras*, in quantities of 1,000 to 1,500 tons to the heap, the ore ranging from one and a half to two per cent. in copper. The heaps are fired, burning slowly for three to six months, after which the ore, then thoroughly and uniformly roasted, is placed in cement tanks which are some five feet deep by one hundred feet long, and thirty-five feet wide, and provided with false bottoms of square timber. The ore is then leached, the leach water running into settling tanks, where the copper is precipitated on pig iron. There are five or six successive leachings, after which the leached ore is taken out, piled in heaps called *terreros*, and weathered again, for re-leaching. Some idea of the immensity of the scale on which the Rio Tinto is operated may be gained from the fact that the mine has about seven million tons of low-grade ore in *terreiros* at the present time.

Copper sulphide ores are converted into sulphates in three ways. The first of these is by weathering, which induces a process of natural decomposition, as instanced in the case of the San Domingos, previously cited. The second method is that of slow-roasting, as just cited in the case of the Rio Tinto. The third system, which is employed at the Rio Tinto, and other mines, consists of roasting copper sulphides with ferrous sulphate, which converts the bulk of the product into copper sulphate. Sulphate of iron is freely produced in the cementation of copper, hence is readily available at small cost, at the Rio Tinto and other mines producing cement copper, in addition to which there is an immense supply of ferrous sulphate (copperas) produced in the weathering process preliminary to cementation, as the Rio Tinto and other Huelva ores are *chalcoppyrite*, which is a compound sulphide of copper and iron. In the chemical reactions attendant

upon weathering, large quantities of ferrous sulphate are produced, and this, after further oxidation, reacts to free sulphuric acid and basic iron salts, the free sulphuric acid attacking the copper and changing it into copper sulphate, which is held in solution and may be made into crude commercial form by evaporation of the water, or precipitated in the form of cement copper, as is desired.

Copper sulphides may also be converted into chlorides by two processes, both of which are used in the Hispano-Portuguese cupriferous fields. In the first of these processes the sulphide copper ores are treated with ferric chloride, or with ferrous chloride and hydrochloric acid. Decomposition is hastened by saturating the ores under treatment with calcium chloride (chloride of lime), or sodium chloride (common salt). The second process, which is quicker, and also gives closer extraction, though the cost of treatment is higher, consists of roasting the raw sulphide ores with a liberal addition of salt. This is known as the dry chloruration process, and is in extensive use at the Rio Tinto, where the ores receive an addition of about one and three-fourths per cent. common salt, and the mixture is roasted in *telerae*. The chlorurized ore is then leached in vats, as already described, and the residuum is placed in *terreros* for further weathering and ultimately a second leaching. A modification of this process is in use at Natrona, near Pittsburg, where residues of Spanish pyrites used in the manufacture of acid are treated by what is practically the same process, though conducted somewhat more expeditiously and expensively. The process is also in use at several Canadian and American points, on a small scale.

The Doetsch leaching process is not in present use, though once employed extensively at the Rio Tinto. This system provides for the treatment of raw sulphide ores, which are mixed dry with about one-half per cent. of ferrous sulphate and salt. The ore is broken to half-inch size, and with the ferrous sulphate and salt is built up into large heaps having channels and chimneys for ventilation. In about two years the weathering is completed, and the copper held in solution in the leach water, amounting to about 80 per cent. of the assay value, is precipitated on iron.

The earlier wet process of Langmade was improved by Henderson in 1860, and remains, with slight modifications, in quite extensive use. It is designed for the extraction of copper from the cinders of cupriferous iron-copper pyrites remaining after the extraction of the sulphur used for the manufacture of sulphuric acid.

The Hunt & Douglass process is an improvement upon the Doetsch leaching process, and while based upon the same general plan, is a modification better adapting the system to the economical work that is now necessary for the earning of profits in the copper trade.

The cement copper resulting from the precipitation of copper from cuprous sulphate solutions upon scrap iron is a very impure mixture of metallic copper with iron, antimony, arsenic, silica, etc., and is washed before reduction to blister copper in blast furnaces.

The principle of electrolysis, or the parting of metals and the redepo-

sition of one of them by the aid of a continuous electric current, was discovered by Faraday in 1839, but was not applied practically to copper refining until 1881, when the Balbach smelting works at Newark, New Jersey, put in a small electrolytic plant. Despite the obstacles met with at the start, the process gave such promise of success in the perfect separation of copper and its allied metals that its introduction was rapid. The process was improved speedily, and three years after its first use in the United States electrolytic plants were in operation in Wales, England, France and Germany. For the refining of blister copper it has no competitor, and is now the cheapest as well as the most thorough process for the refining of all rough coppers.

The process of electrolytic refining, producing copper of that name, is a step in advance of the old methods that produced copper of merchantable grades, though containing considerable impurities, of which gold and silver, especially the latter, were the principal. It being evident that the precious metals did not add to the value of the copper, but were themselves of great value if it were possible to separate them from the copper, various plans for parting the metals were tried, but none of them were completely successful until the perfection of the system of electrolytic refining.

There are two principal systems of electrolytic refining, with a variety of modifications of each. These are known as the series and multiple systems. The former has electrodes in series and tanks in series, or, more frequently, in multiple series. The multiple system has electrodes in parallel arcs, with tanks in series. The series system requires a much greater electromotive force than the multiple plan, and the latter is in more general use. There are a dozen electrolytic refineries in the United States, and no two of them are built or conducted on exactly the same plan, though the main features of the work are similar, the modifications being principally in the minor details. The success of the entire system hinges upon the fact that under electrolytic action metals are dissolved at the negative pole of a battery, and redeposited at the positive pole, when free circulation is permitted in a favorable solution. Varying electric currents give varying effects, and some metals pass over sooner than others, copper being one of the first to go over. As the unrefined copper contains a variety of metals in most cases, it is important that the electrical current be so regulated that none of the other metals pass over at the same time as the copper, or the object of the work is defeated. Not only must the current be carefully regulated, but the nature and circulation of the electrolyte are of prime importance, in securing thorough and economical practice.

Connections between dynamos and tanks are made of high-conductivity copper, necessarily of large size to carry the heavy current used, and of varying forms in cross-section. The tanks may be of wood or slate. The wooden tanks are usually lined with lead, tarred felt, or asphalt, lead being preferable. These tanks usually have their tops about flush with the floor, to permit easier handling of material, and are terraced in series, thus providing for a natural circulation of the electrolyte, which is pumped into the upper tanks, and flows thence, by gravity, into the other tanks of the

series. Overhead trolleys, running along the galleries and aisles between the tanks, provide expeditious means for bringing in the anodes and taking out cathodes, which, in a large plant, are constantly being added and withdrawn, although the making of a single cathode requires several weeks. The anode bars are cast from blister copper, usually running from 98 to 99.5 per cent. pure. These may be made at the smelter, or cast at the refinery from blister copper melted in a cupola furnace kept running for the purpose. Anodes are cast in a variety of forms, but more commonly are thin plates with projecting lugs that rest on the top of the sides of the tanks, one lug resting on the electrical conductor, while the other is insulated.

The composition of the electrolyte varies at the different plants, containing from 5 to 6 parts of sulphuric acid, 15 to 20 parts of bluestone and 75 to 80 parts clean water. The average composition is 16 to 18 parts bluestone, and 6 parts of acid. The heating of the electrolyte promotes the process of decomposition and upbuilding, and produces a smoother deposition of copper on the cathode.

The cathode plates are made of strips of rolled copper about one-quarter inch in thickness, and of varying sizes and forms. These are made from copper sheets, then oiled and coated with fine graphite, to assist in electrical deposition. The process of refining is necessarily continuous, to secure the best results metallurgically and financially, but from two to four weeks is the average time required in making an average cathode. Including the time required in remelting and in various other uses, it may be said that five to six weeks time is required for the making of finished cathodes from the rough copper received, though a much shorter time may suffice in some plants, under exceptionally favorable circumstances. The rate of progress secured depends quite largely upon the purity or impurity of the anodes, the process of electrolysis being greatly facilitated and cheapened by comparatively pure anodes.

As the anodes are torn down and the cathodes built up under the steady effect of the powerful electric current, the pure copper, with minute traces of the impurities present in the anode, is carried over to the positive pole. The great bulk of impurities in the anode are precipitated to the bottom of the tank, as sludge, or slimes. A certain infinitesimal amount of the impurities present in the anode will find their way into the cathode, but not to sufficient extent to injure the product for any commercial use. If more than traces of the impurities are carried over, it is because the electrolyte has become foul, or the current is wrong, or there has been serious carelessness somewhere. The chemist at an electrolytic refinery earns his full salary, for he must be working every minute he is on duty, as frequent assays of anodes and cathodes, and at least tri-weekly determinations of the electrolyte are required. There are local aberrations peculiar to the process which are liable to affect any or every tank, and even individual anodes, requiring constant watchfulness from superintendent, electrician and chemist. The sludge precipitated to the bottom of the tank may form a conducting plate, giving rise to short-circuiting, and should be removed

before large accumulations occur. When the electrolyte becomes too foul for proper use, it is purified, brought up to the proper standard, and pumped back into use again. The slimes at the bottoms of the tanks are siphoned or bailed out, taken to the slime tank, and copper scraps picked out by hand, after which the copper remaining therein is dissolved out by a solution of two to three parts 66 degree sulphuric acid with one part water. The remainder of the precipitate, which may contain gold, silver, tin, lead, zinc, antimony, bismuth, etc., is washed, dried, mixed with soda-ash and then smelted down to base bullion, from which the gold and silver are parted in the usual manner.

The electrolytic refining of copper has been greatly improved during the past decade, and is now in very general use. In 1892 the output of electrolytic copper was about 25,000 tons. Three years later it was 87,000 tons, while in 1898 the output was estimated at 157,000 tons, and for 1902 was probably nearly 250,000 tons—a gain of ten-fold in ten years. The process is in such general use because it serves a two-fold purpose, saving the gold and silver values which had been partially or wholly lost before its adoption, while also producing a product of uniformly high grade. Although Lake copper is best suited for certain uses, and there are other excellent brands not produced electrolytically, the fact remains that electrolytic copper is now the standard of the world, and bids fair to remain such until something akin to a revolution in metallurgy shall give us a refining process better or cheaper. The cost of refining a ton of crude copper by electrolysis varies greatly, ranging from about \$10 up to probably nearly \$25, with \$12 to \$14 as the average figures. Unlike smelting, which can usually best be done near the mine to save excessive freight charges on worthless material, electrolytic refining is performed in most cases nearer the consumer than the producer. The extra freight paid on the very small percentage of impurities in blister copper is so very small a fraction of the total transportation charge that this loss is more than offset by the advantages offered by the cheaper labor, cheaper fuel, and better transportation facilities that are found along the Atlantic seaboard in the United States, where a considerable amount of foreign copper is refined, as well as the bulk of the domestic production.

The possibility of electric smelting has long excited the interest of scientists and practical metallurgists. Various laboratory experiments have resulted well, but it is not a matter of record that any electric furnace is in successful commercial operation. Claims have recently been made that refined copper can be produced direct from mattes, or even from ore, by electrolysis. These claims remain to be demonstrated.

CHAPTER V.

THE USES OF COPPER.

The three indispensable metals of the present age are iron, copper and zinc. The loss of tin, nickel, lead and aluminum would be a severe blow and work great hardship, and even were we to be deprived of such apparently insignificant metals as antimony, cobalt, manganese and platinum, the industrial world would suffer a loss that would entail very disastrous consequences. The taking away of gold and silver, and that useful thief-taker, mercury, which catches most of the world's gold supply, would reduce the globe's finances to chaos. Iron and copper, however, are the main pillars of the metallic structure, while zinc, in addition to many other virtues, possesses the unique quality of being the only electrically negative metal, and without it, copper, for electrical purposes, would be like a "pair" of scissors with but one blade.

The uses of copper are many, and great industries are dependent upon this metal, which affords direct employment to some hundreds of thousands of persons, mostly skilled workman, and annually adds something like five hundreds of millions of dollars to the wealth of the world. The Stone Ages of humanity were followed by the Bronze Age, in which copper and tin were the only metals used, unless the wearing of a few gold and silver trinkets could be said to establish the use of those metals. The Age of Iron followed that of Bronze, and the Steel Age of the latter half of the Nineteenth century is but a later and higher development of the Iron Age, just as the polished stone weapons of the Neolithic Age of ethnologists indicate a period of adaptation and improvement upon the cruder weapons and implements of an earlier day. While iron and steel are not only holding their own, but gaining ground in phenomenal strides, another metal has arisen to claim at least a portion of the honors of Twentieth century civilization, and copper is the foundation of the Electric Age, just as it was the fundamental metal in the Age of Bronze, some milleniums ago.

Of the many uses of copper, electricity is easily the most important. From a plaything for philosophers, in the times of Franklin and Volta, electricity has become one of the prime factors of the life of the present day, and, unless all signs fail, the uses that we consider multifarious, and the installations that we deem immense, are but the precursors of yet better and greater things, of which we may sometimes dream, and from which unsubstantial fabric the flash of Genius and the fires of Labor will bring forth the perfect fruit, for the use of generations yet unborn. A full enumeration of the elec-

trical uses of copper would require a volume, rather than a few paragraphs in a single chapter. The metal is an integral factor in all electrical installations, and for the transmission of power, light and telegraphic or telephonic impulses, is a necessity. The iron wires of pioneer telegraph and telephone lines are rapidly giving way to copper strands. Iron is low in electrical conductivity, making it an inefficient and costly medium for transmission. It is also subject to rust, and its lack of the ductility which is such a prominent characteristic of copper, causes iron wires to break from winds and sleet that would not injure lines of copper. Iron telegraph and telephone wires are still used to a much larger extent than generally imagined, owing to the cheap initial outlay, but the cost of maintenance and repairs renders it certain that iron must give way, sooner or later, at all points, to copper.

The electric light was the luxury of great cities two decades ago; now it is the necessity of every progressive village of so many as a thousand souls. But a quarter century gone, telephones were a scientific toy to the enlightened, and something uncanny and dangerous to the ignorant. Today a network of wires stretches across the American Continent, and Stockholm, upon the banks of the Malar, has one 'phone for every family of its population. The business man at his desk talks with his broker a thousand miles away. The Calumet & Hecla copper mine, one of the world's greatest properties, has telephones nearly a mile below the earth's surface. Timbuctoo shall have them too, before the century's past, and to the pole that's now our goal, we'll telephone at last.

Only fifteen years ago the electric railway was looked upon by conservative persons as a trumpery sort of experiment, scarcely able to deprive the long-eared mule of his appointed mission as motive power for the American street-car system. But where is the mule to-day? His bones lie whitening upon the veldt of South Africa—British South Africa now—and the street cars know him no more.

Electric heating is yet an experiment, but its day will come. Electricity must play a more and more important part in the world's manufactures, both as a motive power and a reducing agent. In the happy days of the future the struggle of coal barons with rebellious workmen will no longer distract a public desirous of fuel for hearth and workshop. In fifty years, or less, the owners of the waterfalls will be the men on whose devoted heads the vials of wrath will be poured out, for they will furnish the heat and power, and will reap the reward of great riches, with corresponding unpopularity. Great as has been the electrical development of the past two decades—and it really began in earnest only a quarter of a century ago—the future assuredly will discount the past. Power, heat and light that can be summoned by the turning of a switch, or the pressing of a button, will, of a certainty, displace the power that comes from laborious stoking; the heat that comes with delay, and much soot and smell, and leaves ashes behind; and the light that comes of striking many matches, and with the effusion of kerosene that is odoriferous. Electric power is already the cheapest form of energy, where waterfalls are used. Electric light is growing both better and cheaper. Electric heat, while dear for ordi-

nary use, at present, will become cheaper. The use of electricity for power, heat and light must become well-nigh universal, in time.

Next to its electrical uses, copper is most extensively employed in engineering; every modern engine has brass oil-cups; brass and copper tubing is used in many boilers; brass, gun-metal, bronze and composition copper bearings are a necessity. Copper and brass boiler tubes are used in locomotives and other high type boilers, having ability to withstand enormous pressures, and being excellent conductors of heat. Copper tubes are used almost exclusively in marine condensers. Until the era of iron vessels, prudent ship-owners sheathed the hulls of their craft with copper, which kept the bottoms clean. Within the past few years this practice has been renewed, with modern steel steamers, on which it is necessary to plank over the hull below the water line, in order to give a backing for the riveting on of the copper sheets. The loss in speed, and consequent loss in time and fuel, brought about by barnacles gathering on iron and steel bottoms, is very great, and the cost of dry-docking and scraping, with loss of time entailed thereby, is probably considerably greater than the expense of wood-sheathing and coppering iron and steel vessels below the water line. Eventually some method will be devised for the plating of copper directly on the steel bottoms of the boats.

Copper is used extensively in architecture, as roofing for buildings, either in sheets or tile form, and in cornices. For the latter use copper is considerably more costly than galvanized iron, but its freedom from corrosion, and its rich appearance without painting, render it desirable for ornamental cornice work on the better class of buildings. Bronze gates and doors for churches and public buildings are highly ornamental, and the most desirable that can be made. Bronze grille work is frequently used, and its richness and permanence cause it to be regarded favorably. In builders' hardware, brass, bronze and copper locks, knobs, escutcheons, butts, bolts, catches and drawer pulls are in steadily increasing favor and use, and from the superior durability and appearance of copper and its alloys, will continue to displace iron in a greater ratio, as the nations increase in wealth and the standard of living is raised. Brass rods for portieres, curtains and stair carpets are in favor. Brass pipes and faucets, usually nicked, are used in the best plumbing, for bathrooms and lavatories, on land and sea, and in railroad sleeping-cars. Extensive use is now made of brass rods in devices for window displays and in various mechanisms for exhibiting goods, in retail business places.

The domestic uses of copper and brass are varied. Brass beds and furniture attract by their cleanliness, beauty and durability. Brass or copper lamps, for kerosene oil, are more durable and ornamental than those of glass and other materials, and also far safer. The consumption of high grade brass piping and castings, for gasoliers and electroliers, is enormous, and constantly increasing, displacing the crude iron pipes and castings of the preceding generation. In the kitchen the brazen kettles of earlier days are losing ground. There is no material better fitted for cooking, when carefully cleaned, and none that may cause so much trouble, if neglected.

Within the past few years, copper has been used for roofing passenger coaches of railroads, with good results. The ideal passenger car of the future will have a steel frame, a copper roof, a wooden interior finish with brass fittings, and paper wheels.

Wherever there are waterworks, brass faucets and valves will be found. The consumption of brass for valves is enormous, and for very many uses these valves, while very costly in the larger sizes, are economical in the end.

For more than two thousand years statues have been made of bronze. Iron turns to rust, wood decays, and marble is discolored, but bronze retains the beauty and finish of the sculptor, and is subject to a slight corrosion only, in the course of ages, when buried in the earth. For decorative purposes bronze is used for vases, urns and similar ornamental receptacles.

Copper and its alloys have been employed for coinage from time immemorial. Originally copper was a purely money metal, like gold and silver, and each copper coin, unless debased by the short-sighted cunning of the petty tyrant, oligarchy or democracy of the day, represented upon its face merely the intrinsic worth of the metal contained. The inherent impossibility of keeping three separate metals upon any fixed parity led to the relegation of copper to the status of token money, for the same reason that silver coins were made merely a token money also, by the leading commercial nations of the globe, during the century just passed. The Chinese still give honest values in their brass money, and the experience of Europeans, who require a coolie with a wheelbarrow to carry around the change for a gold sovereign, is typical of what would be the case over the entire world if copper had not been eliminated from the list of purely money metals. The annual consumption of copper for coinage is much greater than would be anticipated by anyone who has not given the matter a little investigation.

The followers of Mars are liberal consumers of copper. The brass cannon, so popular fifty years ago, are now used mainly for firing salutes, ornamenting public squares, and trading to the heathen. Notwithstanding the disuse of the metal for ordnance, except in small salute-guns for yachts, more copper is now used for munitions of war than was ever consumed in the casting of cannon. Brass and copper cartridge cases, cold stamped from tough sheets, are consumed annually to the extent of hundreds of millions, by the world's armies, for machine guns and small arms, and to a scarcely smaller extent by hunters. Hundreds of tons of the best tough metal are consumed annually, merely to make the brass buttons that decorate the uniforms of the world's armies and navies. Brass fittings and buckles for men and horses, brass canteens, drinking cups and cooking utensils, also require much copper. It is probable that copper must give way to aluminum for these latter uses, throughout the world, as aluminum is lighter and tarnishes less easily. The copper exploders, used in every metal mine where modern methods are employed, afford another use, apparently trivial, yet which is one of the scores of minor demands that in the aggregate foot up thousands of tons annually.

In the arts and manufactures copper plays a highly important part. The great vacuum pans of the sugar factories and refineries are made of copper.

There are copper vats in pulp and paper factories. The worms and stills of distilleries are of copper, and the copper brewing kettles in which beer is made are of immense size and numbered by thousands. There is scarcely a manufacture that does not make more or less use of copper or brass, in some one or more of the processes employed. The works and cases of Yankee clocks, now to be found in the most remote corners of the earth, are of brass, as are the gear wheels and pinions of watches and other instruments of precision. The manufacturers of scientific instruments and optical goods are excellent patrons of the brass-founder. From him are obtained the alloyed metal that, under many forms, as sheets, tubes, rods, wires and castings, make up the bulk of the construction of microscopes and telescopes, of surveyor's transits and draughtsman's protractors, and of the many strange instruments of marvelous complexity and variety that do human work without the element of human fallibility.

The textile manufacturers use copper rolls for stamping patterns upon calicos and print cloths. Brass platens upon typewriters are used to aid in manifolding. Signs of copper and brass stare at us from every corner of crowded city streets. Copper leaf is used by sign writers and in other ways. Comminuted copper is used for bronzing.

The uses of copper enumerated in the preceding paragraphs of this chapter are for the metal and its metallic alloys. There are alloys, such as nickel-copper, arsenic-copper, aluminum-copper and others, hitherto unmentioned, which are used for a variety of special purposes. In addition to the uses of copper and its metallic alloys, there are highly important utilities for various ores and compounds of the metal. Malachite, when found massive and pure, is a semi-precious stone of great beauty and much in demand for table-tops and interior architecture. Other ores are ground up for pigments, several beautiful shades of green and blue being secured from mixtures having copper ores as bases.

The most important copper mineral, for other uses than the production of metal therefrom by smelting, is sulphate of copper, the common blue vitriol of commerce. This is occasionally found in nature, as chalcantite, but is almost invariably a product of manufacture. This compound is one of the most important chemical agents known to science and industry. It is a necessity in the electrolytic refining of crude copper. It is a component part of all wet batteries, and as such rings our door-bells, transmits our telegrams, and is the energizing agent that permits the transmission of the human voice over the wires of the telephone. In electro-plating, electrotyping and kindred industries, it is the prime factor. As an insecticide it stands without an equal; dilute solutions of sulphate of copper stayed the ravages of the phylloxera when the vineyards of France seemed doomed. It is probable that not less than one hundred thousand tons of copper sulphate, containing a quarter of its weight in metallic copper, is consumed every year in spraying the vines and fruit trees of Europe and America, and thus it may be said that it is to copper that we owe the sparkling wines of France, the peerless American apple, and the blushing peach that reaches perfection on every continent.

The consumption of sulphate of copper is not confined to viticulture and the electrical industries, as it is consumed by the thousands of tons monthly in the textile factories, in the chemical industries, and in manufactures of lines so varied as to make their mere enumeration fatiguing.

The question of substitution of other metals is one that comes up periodically. Aluminum is often mentioned as the metal that is to displace copper almost entirely. There is little likelihood of such a consummation, unless aluminum can be made at a fraction of its present cost. Aluminum is the most common of all metals, being the base of every clay, but it is reduced with great difficulty, and at heavy cost, by electrolysis, but it is a useful metal, with a distinct sphere of its own. Several of its alloys are of much utility, and the pure metal, owing to its lightness, is available in many places where steel and copper are less desirable. Aluminum has fair electrical conductivity, but is not apt to replace copper to any great extent for electrical uses, unless aluminum goes down and copper goes up in cost.

In lines other than electrical copper has many substitutes. These come into use when the metal is high, and go out when the cost of copper falls. Like all other commodities, copper finds its level. High prices encourage substitutions and decrease consumption in other ways, while low prices encourage the substitution of copper for other materials in many places. The true value of copper is, like the true value of all other commodities, the price at which enough metal can be produced, at a fair profit, to supply the world's legitimate requirements at a reasonable price. An era of high prices stimulates production and restricts consumption, with an eventual collapse of prices and trouble to producers. An era of low prices restricts production, stimulates demand and plainly foreshadows future grief for the consumers.

The era of copper manipulation, beginning in 1899 and ending early in 1902, was marked by unnaturally high prices, greatly restricting consumption, followed by abnormally low figures that caused the speedy absorption of the large surplus of metal previously stored up by reason of unduly high prices. The course of the metal market during 1903 was more regular and more free from manipulation than since 1898, but the suspicions of purchasers remain active. Having suffered from previous interference with the natural law of supply and demand in the copper market, it is but natural that they should fear further tactics of the same sort, and weigh the evidence at hand quite closely, before making market commitments.

The best interests of producers and consumers alike will be served by a perfectly natural market, in which the level of prices is determined by the supplies on hand and the consumptive capacity of purchasers. Copper consumers are prone to think that the abnormally high prices of 1899-1901 were secured solely at their own cost, yet as a matter of fact the producers suffered also, to no small extent, from the selfsame inflation. By reason of the unduly high prices then ruling many new mines were opened, to compete with those already developed, and their competition, brought about by the era of high prices, became effectual after prices had dropped sadly. Not only this, but the cost of producing copper advanced materially by

reason of the high market price. Costs were increased, not only through higher wages paid workmen, but by reason of a general slackening of vigilance in guarding small leaks, it seeming impossible for any corporation to be as careful in good times as in an ordinary season. It has taken the better mines several years to get back, even partially, to the vantage ground of costs occupied before the era of boom prices that begun in 1898.

CHAPTER VI.

GLOSSARY OF MINING TERMS.

In this section of the Copper Handbook the glossary, first appearing in the 1902 Edition, has been materially amplified, and will be found to give nearly all of the terms used in copper mining, milling and smelting.

ACID. An acid rock is one in which bases are combined with acids, forming salts. The antithesis of basic.

ADIT. A tunnel. A mine opening, driven from the surface into a hill or mountain, on practically a horizontal plane, only enough rise being allowed to provide for natural drainage and to allow the easy removal of cars bringing rock from the breast of the working. An adit can be driven only where the surface is mountainous or quite hilly.

ADOBE. Sun-dried brick.

AIR-BLAST. A violent explosion, caused by the escape of air compressed by the settling of the upper workings of a deep mine.

AIR COMPRESSOR. A machine for condensing air to a pressure sufficient to actuate machinery, when delivered underground or elsewhere at a considerable distance.

AIR-DOORS. Owing to strong currents of air frequently found in the depths of mines, it is sometimes necessary to build a little chamber in a drift connecting two shafts, with a door at either end, to prevent the strong air currents blowing out the lamps and candles of the miners.

AIR-DRILL. A power drill operated by compressed air.

AIR-SHAFT. A shaft sunk solely to provide ventilation for deep workings, or else an old shaft kept open solely to furnish air to the mine. Nature provides a means of ventilating even very deep mines. Two shafts, one of which is sunk on slightly higher ground than the other, will provide natural ventilation underground as soon as connected by a drift. The longer shaft becomes a chimney and the shorter an inverted syphon, down which the air is sucked with great force.

ALKALI. An alkali is a lye—the opposite of an acid.

ALLOY. Two or more metals united mechanically, but not chemically, by fusion.

ALLUVIUM. Soil or broken rock deposited by the action of water.

ALTERED. A rock that has undergone changes in its chemical and mineralogical structure since its original deposition.

ALUMINOUS. A rock having aluminum as a base or prominent constituent element.

AMALGAM. A union of mercury with other metals, such as gold, silver or copper. Mercury will not amalgamate with iron.

AMALGAMATION. The process of uniting gold, silver or copper with mercury. The quicksilver is expelled later by heat and recovered for further use.

AMORPHOUS. Without form.

AMYGDALOID. A trap rock, of igneous origin and frequently of highly complex structure, the name coming from the little pits or amygdules of softer rock-material found therein. In the Lake Superior copper district the copper-bearing amygdaloids frequently show the native copper in the amygdules left by the leaching out of the softer rock originally contained therein.

AMYGDALOIDAL. Of the nature of or akin to an amygdaloid. Word used in England, in place of amygdaloid.

ANALYSIS. A complete chemical test of any given substance.

ANHYDROUS. Devoid of water.

ANTICLINAL. A fold of rock-strata bulging upward, in saddle-shape. The reverse, geologically, of synclinal.

ANTIMONIDE. An ore of any metal or metals chemically united with antimony.

APEX. That part of an ore vein at or nearest surface. Usually requires opposing experts and several lawsuits to determine. In case of litigation the apex is usually owned by the litigant having the most money.

APICES. Apexes.

ARASTRA. A Chilean mill. A circular trough, in which broken ore is pulverized by a revolving wheel or mill stone.

ARENACEOUS. Of a sandy nature.

ARGENTIFEROUS. Silver-bearing.

ARGILLACEOUS. Of a clayey nature.

ARROBA. A weight of varying heft. Spanish, 25.36 pounds avoirdupois. Portuguese, 32.38 pounds.

ARSENIDE. An ore of any metal, or metals, with which arsenic is chemically united.

ARSENOPYRITE. An ore of any metal or metals with which arsenic and sulphur are chemically united.

ASSAY. A chemical test of ore or metal to determine its exact content and value in any given metal or metals.

ASSESSMENT WORK. The amount of work required annually by the United States government, from the holders of an unpatented mining claim.

ATTLE. Cornish term for waste rock.

AURIFEROUS. Gold-bearing.

AUXILIARY. An auxiliary engine or machine is one kept in reserve, for use when the principal machine is idle for repairs or other reasons.

AVERAGE PRODUCE. Cornish term for percentage of copper in ore.

BACK. The roof of rock above any mine opening driven on a horizontal plane.

BAD AIR. Air in which miners cannot work, due to powder fumes, noxious gases or insufficient ventilation.

BAL. Cornish name for a mine.

BALANCE BOB. A counterweight for pump rods.

BALL HEAD. A steam stamp, so called because invented by a man named Ball.

BALL STAMP. A Ball head.

BARILLA DE COBRE. Spanish term for native copper, dressed, but unsmelted. Equivalent to the "mineral" of Lake Superior mines.

BARREL WORK. Copper in small masses, detached from its rock-matrices at the rock-house, and shipped in barrels direct to the smelter. Small masses, of a size to put in barrels.

BARROW. A wheelbarrow; also same as burrow.

BARTLETT. A Bartlett concentrating table.

BASALT. A trappean rock.

BASIC. A rock in which metals are combined with alkalis, such as potassium, sodium, etc.

BASIN. A synclinal; a trough in the earth's surface.

BATTERY. A set of gravity stamps, usually five in number, but sometimes less.

BEARING. The bearing of a mineral outcrop is its strike.

BEATING AWAY. To cut down or stope a mineral body.

BED. A stratified rock formation. Used in some mineral districts to mean veins or lodes lying horizontally, or approximately so.

BED-ROCK. The solid rock as differentiated from loose or surface rock. The ledge.

BELLS. Signals for lowering and hoisting the bucket, skip or cage in a shaft are usually given by bells, the number of strokes indicating the nature of the load, the place for landing, etc.

BIT. A steel drill. A short hollow cylinder of soft steel, used in diamond drilling. The diamonds are set around the inner and outer edges of the bottom of the bit and cut away the most refractory rocks when the bit is rotated.

BLACK COPPER. Copper partly smelted, but containing impurities requiring refining.

BLACK JACK. Zinc blende.

BLAST. To explode dynamite or black powder. Air forced into a furnace to aid in reducing the ore charge.

BLASTED. A miner that has been blasted is one who has been injured by the explosion of a charge of dynamite or gunpowder.

BLASTING. The breaking of rock by means of high explosives inserted in holes bored in the rock for the purpose.

BLLENDE. Zinc blende.

BLIND DRIFT. A drift connected with the other workings of the mine at one end only. A cul de sac.

BLIND LODE. A lode that does not come to surface.

BLIND SHAFT. A shaft not coming to surface. A winze.

BLISTER COPPER. Copper of 96% to 99% pure.

BLOCKHOLE. A hole for explosives drilled in a mass of ore or rock already broken from the vein, but too large to handle.

BLOCKING OUT. To open the ore in a mine so that it can be won merely by stoping.

BLOSSOM. An outcrop of an ore body altered by weathering.

BLOWER. A fan used to force air into a mine.

BLOWING IN. A furnace or smelter is blown in when charged and the process of ore reduction begun by fire.

BOILING SHAFT. A sand-shaft in which quicksand and water boil up from the bottom.

BONNET. The cover or roof of a cage.

BORE HOLE. A drill hole bored for test purposes.

BORT. A form of crystallized carbon between the diamond and the black diamond.

BORTZ. Bort.

BOTTOMS. Impure copper formed below the matte, in matting copper ores.

BOULDERS. Detached masses of rock, rounded by attrition, usually found at or near the surface, in alluvial deposits lying above stratified rocks.

BOX CANON. A canyon closed at one end.

BRANCH. A vein branching off from the main ore body.

BRATTICE. A screen for the regulation of air currents in a mine opening.

BREAST. The face or working end of a drift, stope or adit.

BRECCIA. A conglomerate rock, in which angular fragments of rock are cemented together.

BRECCIATED. A rock stratum made up of sharply broken fragments, partially or wholly cemented together.

BROKEN. A vein is broken when lacking clearly defined walls or characteristics of regularity.

BROKEN GROUND. Rock strata where the walls are poorly defined and the general formation unsettled.

BROOD. Cornish for waste ore, such as mundic or zinc blende, where found in connection with copper ores.

BUCKET. A kibble. An iron or steel bucket used for hoisting in a mine. In a vertical shaft a bucket swings free in ascending and descending, but in an incline shaft the bucket runs on a skidway of plank or timbers, or else rides a trolley cable.

BUDDLE. A conical table on which ore is dressed. Machine and name both growing obsolete.

BULKHEAD. A wooden or masonry partition walling off a mine opening.

BULLION. Refined gold or silver before coining. Sometimes erroneously applied to copper.

BULLION BARS. Unrefined gold and silver secured by melting the precious metals precipitated to the bottom of the tank in the electrolytic refining of argentiferous and auriferous copper anodes.

BUNCH. A pocket exceptionally rich in mineral.

BUNCHY. An ore body given to considerable variations in width or values, or both.

BURDEN. Overburden.

BURROW. See rock burrow.

CABLE. The steel wire rope used in shafts for hoisting buckets, skips or cages.

CAGE. An elevator used in vertical shafts for hoisting mineral and for lowering men, timber, etc.

CAKES. Copper cast in cakes.

CALCAREOUS. Of a limey nature.

CALCINE. To drive off sulphur or other volatile constituents of an ore by heating.

CALCITE. Crystals of calcium carbonate.

CAM. A curved tooth, fixed on a shaft, for lifting the pistons of gravity stamps.

CAMP. A mining town.

CANON. (pronounced canyon). A deep gorge with precipitous walls.

CANYON. A canon.

CAP. The top piece of a framed set of mine timbers: copper caps containing fulminate of mercury, used to explode dynamite in blasting rock. The fuse is cut to proper length, one end placed in the cap, and the cap inserted in a pasty dynamite cartridge. The free end of the fuse is fired, and the explosion follows quickly or tardily, as the fuse is cut long or short.

CAPPING. The rock or other ground overlying the mineral body of a mine.

CAP-ROCK. Capping.

CAPTAIN. A man in charge of mining work is termed a captain. The mining captain is the executive officer underground.

CARBONACEOUS. Of a coal-like nature.

CARBONATE. An ore of any metal or metals with which carbon and oxygen are chemically united.

CARBONIFEROUS. Rocks of the geological ages usually associated with coal measures.

CARGA. A Mexican weight equalling 300 pounds avoirdupois.

CARTRIDGE. Dynamite put up in cylindrical cases of oiled paper to fit the holes bored by the drills.

CASING. The wooden lining of a shaft; an iron pipe put down outside of a diamond drill hole when passing through soft or broken ground, to prevent the hole becoming clogged by matter intruding from outside.

CASTING COPPER. Refined copper better suited for casting into various forms than for drawing into wires or rolling into sheets.

CAVE. A natural opening or "vug" in a rock formation; the partial or complete falling-in of a mine.

CAVING SYSTEM. A plan of mining, by which the worked out upper levels and surface are allowed to subside gradually as the mine workings are deepened.

CEMENT COPPER. The impure metal obtained from ores by leaching processes.

CERRO. Spanish for a hill showing rock outcrops.

CHAMBER. A large stope.

CHAPEAU DE FER. French for gossan or iron hat.

CHARGE. The amount of ore, flux and fuel required for one filling of a furnace.

CHIMNEY. An ore chute.

CHERT. A coarse flint containing calcium.

CHILEAN MILL. An arastra.

CHILE BARS. Bars of Chilean blister copper, weighing about 200 pounds each.

CHLORIDE. The ore of any metal or metals united chemically with chlorine.

CHURN DRILL. A drill having a churning motion, used for boring test-holes, or wells.

CHUTE. A section of a lode or vein differing by being much richer or leaner than the average.

CLACK. A pump valve.

CLAIM. Public land staked off and claimed by a prospector or miner. Size of claims varies in different countries.

CLAY COURSE. A seam of clay between vein and wall.

CLAY SLATE. An argillaceous slate.

CLEAN-UP. The cleaning up of accumulated ore or metal in a mill or smelter.

CLEAVAGE. The parting of rock along more or less regular lines of least resistance.

COARSE JIGS. The jigs used to handle the heavier grades of ore or metal.

COARSE METAL. Matte resulting from the first smelting.

COBBING. Breaking masses of ore into lumps by hand hammers.

COLLAR. The top of a shaft—the surface timbering of a shaft.

COMPANY ACCOUNT. Miners and other underground employees working on fixed wages per shift or month are usually called "company 'count men" to distinguish them from miners working on contract.

COMPARTMENT. Mining shafts are usually divided into two or more compartments, separated by framed timbers and planking.

CONCENTRATES. The concentrated ore or metal, after elimination of gangue rock.

CONCENTRATION. The process of separating native metal or ore from its gangue of worthless rock.

CONCENTRATING TABLES. Concentrators.

CONCENTRATOR. A plant where ores are concentrated; a jig. A machine for separating ore or metal from gangue-rock, the process usually employing a rocking or oscillating motion, aided by jets of water, whereby the worthless gangue is driven off and the heavier mineral retained by specific gravity.

CONDUCTIVITY. Electrical conductivity is measured by the resistance offered to the passage of an electrical current.

CONGLOMERATE. A pudding-stone rock formed by deposition of rock particles on old sea-beds, afterward covered by other rock strata.

CONSTRUCTION ACCOUNT. Many of the Lake Superior copper mines summarize their finances so that the cost of operation is divided into two classes, one being for general working expenses and the other for construction account. The latter includes new buildings and machinery on surface, and frequently new mine openings. In effect the construction account of a mine is like the stock account of a merchandise firm, and sometimes, like charity, "covers a multitude of sins."

CONTACT VEIN. A mineral body found between two unlike rock strata.

CONTOUR. The outline or configuration of any given tract.

CONTRACT. Many miners work on contract, agreeing to sink, drift or stope at a fixed price per running foot, or per fathom. These are known as contract-miners, and are usually the more skilled workmen.

COPPER ORE. See detailed descriptions of copper ores and copper-bearing minerals in chapter on chemistry and mineralogy.

CORE. A drill core.

CORNISH PUMP. A form of mine pump actuated by long rods reaching from surface down the shafts.

CORNISH STAMP. A gravity stamp, in which the heads are raised by cams and dropped by gravity.

COST BOOK SYSTEM. A plan of mine operation, used in Cornwall only, by which shares are subject to unlimited assessment. A sort of unlimited partnership.

COSTEANING. Developing. Proving an ore body by trenching across its outcrop at approximately a right angle.

COUNTERBALANCE. Hoisting plants are usually worked in counterbalance for deep shafts. The weight of the descending cage or skip is used to partially offset the weight of the cage or skip ascending.

COUNTER VEIN. A cross vein, running at approximately right angles to the main ore body.

COUNTRY ROCK. The predominant rock form of the district.

COURSE. The direction or strike of a mineral body.

CRAB. A hand winch.

CREEPING. The movement caused in mines by the pressure of superincumbent and adjacent rock masses.

CROPPINGS. Outcrops.

- CROSS COURSE.** An intersecting vein.
- CROSSCUT.** An opening similar to a drift, except that the crosscut is sent at approximately right angles to the formation, while a drift follows the trend of the lode or vein.
- CRUCIBLE.** A vessel of refractory material, used to contain ores and metals for assaying or smelting.
- CRUSHER.** A rock-crusher.
- CRYSTALLIZED.** Having plainly defined crystals.
- CRYSTALS.** Geometrical forms, with plane faces, of infinite variety, assumed by the majority of minerals.
- CUPOLA.** A furnace in a smelter.
- CUPRIFEROUS.** Copper-bearing.
- CUTTING DOWN.** When a shaft is enlarged, work begins at the top, and the work of enlargement is called cutting down.
- CWT.** A hundredweight, of 112 pounds avoirdupois.
- DAM.** A masonry barrier, built underground, to hold back water.
- DATUM LEVEL.** The level (usually sea-level or mean level of nearest considerable body of water) from which altitudes are measured in surveys.
- DEAD ROASTING.** Sulphide ores are dead roasted when all the sulphur possible to drive off by roasting has been eliminated.
- DEAD WORK.** The opening of new shafts, drifts and winzes, preliminary to the stoping of the mineral bodies.
- DEBRIS.** Broken down rock material.
- DECOMPOSED.** Rock or ore broken down by elemental action.
- DECREPITATE.** To break into fragments with violence, under the blow-pipe or great heat.
- DENUATION.** The uncovering of rock strata by the weathering of wind or water, or both.
- DEPOSIT.** A term, loosely used, meaning a mineral body.
- DERRICK.** A mast, freely rotatable, carrying a boom or yard-arm, at the end of which is a sheave wheel. Used in mining mainly for open pit work.
- DESSICATION.** The drying out of water for any given substance.
- DETRITUS.** Debris. Broken down rock.
- DEVELOPMENT WORK.** Dead work.
- DIAMOND DRILL.** A machine for boring holes in rocks, taking its name from the black diamonds or bortz used to form cutting edges on the inner and outer edges of the hollow cylindrical bit.
- DIE.** The iron block in the mortar, on which the ore is fed for crushing under the stamp.
- DIORITE.** Greenstone. A crystalline spathic hornblende.
- DIP.** The angle at which a lode or vein descends from the earth's surface.
- DIP COMPASS.** A compass having the needle fixed to swing in a vertical plane.
- DIRT.** Frequently used to describe the ore broken underground.

DISSEMINATED ORE. Ore found scattered through a gangue of valueless rock.

DISTURBED. An ore body is disturbed when lacking defined walls and settled character.

DOLLY. A crude prospecting stamp, set on a spring pole.

DOLOMITE. Magnesian limestone; carbonate of calcium and magnesium.

DONKEY HOIST. A small auxiliary hoisting engine, usually operated underground and actuated by compressed air; or else used for preliminary work at new shafts or exploring pits.

DOWNCAST. A shaft having a downward air current.

DRAFTAGE. An arbitrary allowance claimed by English smelters to cover loss of weight in transport.

DRESSING. Separating ore from gangue rock by hand or machinery.

DRESSING FLOOR. A floor or dirt surface where ore is dressed by clobbering and other hand work.

DRIFT. A horizontal opening in a mine, following the direction of the lode or vein; loose alluvial matter, such as sand, pebbles and boulders.

DRIFT COPPER. Native copper found in alluvium far from its original rock matrix, whence carried by glaciers.

DRIFTING. Opening drifts. Driving.

DRILL. A steel bar for boring in rock, having a single sharp cutting face, or two cutting faces crossed at right angles.

DRILL-CORE. As the bit of a diamond drill is hollow, solid, cylindrical cores of rock are cut by its operation. These are raised to surface and form a valuable permanent record of the strata through which the drill has passed.

DRILL HOLE. A hole bored by a drill.

DRIVING. Drifting.

DROP SHAFT. A shaft, usually of heavy framing, sunk by weight, through sand or similar material.

DRUM. The cylinder of a hoisting engine, around which the cable winds.

DRUSE. A vug.

DUCTILE. That which is capable of being extended in length by tension.

DUCTILITY. The capacity of a metal to elongate, when under pull from the ends, without cracking or breaking.

DUMP. A place for dumping rock taken from a mine. An ore-dump contains good mineral, and a waste-dump the worthless rock hoisted from underground.

DYKE. A fissure in the rock formation, usually transverse, filled with igneous matter. When mineralized, dykes are called cross or counter veins.

DYNAMITE. Nitro-glycerine absorbed by wood pulp, infusorial earth, or some similar article to render it safer in use.

EISENER HUT. German for Iron Hat or Gossan.

ELECTRIC DRILL. A power drill operated by an electric current.

ELECTROLYTE. The solution in which electrolytic separation of metals is carried on.

ELECTROLYSIS. The separation and redeposition of metals by electrolytic action.

ELECTROLYTIC. Term applied to copper means copper gained from impure metal by electrical decomposition and redeposition, whereby the copper is taken from an impure bar and redeposited in a pure form at the opposite pole of the battery, while other metals are precipitated to the bottom of the tank in which this work is done.

ELVAN. Cornish name for the dyke rocks of Cornwall, usually greenstone or porphyry.

EROSION. The wearing away of surface masses of rock and soil by the elements and by glacial action.

ERUPTIVE. Rock matter supposed to have been deposited in molten form by volcanic action.

ESCARPMENT. A rock wall, nearly or quite vertical.

EXFOLIATION. The separation of thin leaf-like layers from the main body.

EXPLODERS. Fulminating caps.

FACE. The breast of a drift. A face of ore is the ore shown at the working end of a drift or stope.

FAHLBAND. A banded crystalline rock, carrying finely disseminated sulphide ores.

FALL OF GROUND. Rock falling from the roof into a mine opening.

FALSE SET. A temporary set of timber.

FAN. A device used to force air into a mine.

FATHOM. Six feet. In stoping, a fathom is a cube of six feet.

FAULT. Dislocation of a rock stratum by which continuity is lost.

FEE. The ownership of land in fee-simple.

FEE-OWNER. The owner of land in fee-simple.

FEEDER. A branch ore vein.

FERRUGINOUS. Carrying iron.

FILLING. Allowing a mine to fill with water. Occupying old stopes or chambers with waste rock.

FINES. The finer ores or metals saved in concentrating processes.

FINISHER JIGS. The jigs used to save the fine ores or metals in a concentrator or stampmill.

FIRE. The miner's warning cry when a blast is to be set off, is "fire."

FISSILE. That which may be easily split.

FISSURE. Rock matter foreign in nature to the walls on either side—evidently deposited at a later date geologically, in a crack in the original rock.

FISSURE VEIN. A fissure, containing ore, usually disseminated in a worthless gangue differing in nature from the country rock in which the fissure occurs.

FLAKE COPPER. Very fine scales of native copper.

FLEET-GEAR. A compensating device for taking up slack and paying out rope where a hoisting system is worked in counterbalance. Several turns of the cable are taken around each drum of the hoist, and the bight of the cable is carried to the rear and around a large sheave-wheel lying horizontally and traveling on trunnions, allowing the taking up or paying out of the cable.

FLOAT COPPER. Drift copper.

FLOOR. The floor of a drift or other horizontal mine opening; the underlying rock stratum.

FLOUR COPPER. Very fine native copper that floats on water and is very difficult to save in milling.

FLUCCAN. A seam of clay, found in ore bodies, or, more frequently, between the ore and walls of country rock.

FLUKAN. Fluccan.

FLUME. A launder or pipe line for carrying water.

FLUX. Any mineral or ore used in the furnace to aid in fusing the gangue rock and worthless elements, which combine with the flux to form slag.

FOLIATED. Having a laminated structure.

FOOT. The foot-wall.

FOOT-WALL. The foot. The stratum of rock underlying an inclined mineral lode or vein.

FORKING. Pumping water from a mine.

FORMATION. A term used to imply the general geological conditions of a given district.

FOSSICKING. Extracting metal or ore from old mines or waste burrows.

FRACTURE. A break.

FREE. A metal is free when virgin or native, and not combined chemically with any other element.

FREE-MILLING. A metal or ore that is readily separated from its accompanying rock by mechanical means.

FRIABLE. Easily crushed to a powder.

FURNACE. An oven for the smelting of ore.

FUSE. A cotton cord with a gunpowder core, so made as to carry fire to an explosive placed for use.

FUSIBLE. That which can be melted.

FUSION. Melting. Alloying metals while liquid, through heat.

GABBRO. A rock composed mainly of plagioclase feldspar.

GAD. A small wedge or chisel.

GALLERY. A drift.

GANGUE. The particles of foreign rock matter adhering to disseminated ores or native metal; the gangue rock is mechanically and not chemically united with the ore or metal.

GASH VEIN. A shallow fissure vein, usually wide at surface and rapidly narrowing to extinction.

- GEODE.** A hollow nodule of rock.
- GEOLOGY.** The science of the earth.
- GIANT POWDER.** Dynamite.
- GLACIATION.** The erosive effect produced by glaciers.
- GLANCE.** Any metallic sulphide showing a bright, shining surface.
- G. M. B.** "Good Merchantable Brands"—an English grade of refined copper.
- GNEISS.** A banded, slaty granite.
- GOB.** Mud above a mine. Refuse in worked-out openings.
- GOPHERING.** Prospecting work confined to digging shallow pits or starting adits. Term used from similarity of this work to the crooked little holes dug in the soil by gophers.
- GOSSAN.** Iron Hat. A rock capping, usually quartzose, showing reddish-brown iron stains, from decomposed iron pyrites. Frequently found overlying sulphide ores of copper.
- GRADE.** The percentage or value, when applied to ore bodies and partly refined metals.
- GRANITE.** A dense, granular rock, composed of varying aggregates of quartz, feldspar and mica.
- GRANULATED.** In the form of grains.
- GRASS ROOTS.** At surface.
- GRAVITY STAMP.** A stamp, usually set in batteries of five, in which the piston is raised by a cam, the stamp crushing the charge in the mortar by its weight when allowed to fall.
- GREENSTONE.** Diorite, or gabbro.
- GRIZZLY.** A grating of heavy iron or steel bars, through which the smaller pieces of rock or ore fall.
- GROSS TON.** A long ton of 2,240 pounds avoirdupois.
- GROUND SILL.** The bed-piece of a set of mine timbers.
- GUIDES.** Perpendicular wooden stringers for guiding cages in vertical shafts.
- GUT.** To rob.
- HADE.** (American). Dip of a vein from the zenith. (English). Dip of a vein from the horizon. Take your choice.
- HALVAN.** Cornish for refuse copper ore.
- HANGING.** The hanging-wall; the stratum of rock overlying an inclined mineral lode or vein.
- HARDHEAD.** A lump of partly smelted ore, carrying high percentages of refractory elements, such as iron, antimony and arsenic.
- HAT.** The capping of a mineral body.
- HAULAGE PLANT.** A mechanical installation for the underground tramming of rock, operated by ropes, compressed air or electricity.
- HEAD.** Water pressure.
- HEADGEAR.** A building, or framework, fitted with sheaves, over the mouth of a shaft.

HEAP-ROASTING. Burning the sulphur out of ores piled in heaps with a small amount of wood or other fuel.

HEAVE. A fault. The rolling out of line of dip by a lode in making depth.

HEAVING. Rolling.

HECTARE. A metric measure equalling 2.471 acres.

HOIST. An engine for hoisting, the rope, as raised, being coiled around a drum.

HOISTER. A hoist.

HOLE. Any opening in the ground. More especially a hole drilled for explosives.

HOLING THROUGH. A drift or other mine opening is holed through when a connection is made between two separate ends working toward each other.

HORIZON. The sky-line, commonly used in the sense of absolutely flat, as shown by a spirit level. Geologically, all rock strata of the same geological period.

HORSE. An intrusion of country rock into a mineral body. Sometimes synonymous with dyke.

HORSE-WHIM. A windlass operated by horse-power.

HUEL. Cornish for mine. Commonly spelled wheal.

HUNGRY. Nearly or quite barren of mineral value.

HUNTINGTON MILL. An improved Chilean mill.

HYDRATED. Containing water of crystallization.

HYDRO-METALLURGY. The reduction of ores by wet processes.

HYDROUS. Containing water.

IGNEOUS. Rocks of volcanic origin.

IMPREGNATED. Containing ore. Properly used in referring to country rock carrying mineral similar to that in the vein.

IN PLACE. Rock matter in the position where deposited by nature.

IN SITU. In place.

INCH. See Miner's Inch.

INCLINATION. The dip of a vein from the horizon measured in degrees.

INCLINE SHAFT. A shaft sunk at any angle with the horizon under 90°.

INCRUSTATION. A solidified coating, usually crystallized.

INFILTRATION. The deposition of mineral matter from percolating water.

INGOT. A mass of metal cast in a peculiarly formed mold; applied only to gold, silver or copper. Iron is cast in pigs.

INTAKE. The opening for water to enter a pipe or flume.

IRIDESCENT. Showing the colors of the rainbow.

IRON HAT. Gossan.

JIG. A machine for concentrating ore or mineral by means of oscillatory

or vibratory motion, aided by jets of water, separation of the ore from its gangue being effected by the greater specific gravity of the former.

JIGGER. A crude jig.

JIGGING. Concentrating ore by the use of a jig.

JUMPER. A churn drill.

JUNCTION. The uniting point.

KEWEENAWAN. Pertaining to or of the Keweenaw formation, in which the Lake Superior copper mines are opened.

KIBBLE. A bucket used for hoisting material in a shaft.

KILLAS. Clay slate or shale.

KILOGRAM. A metric weight of 2.2046 pounds.

KILOMETER. A measure of distance equalling 0.621376 miles.

KINDLY. Appearance of rock carrying or promising to carry good mineral values.

LADDER ROAD. A ladderway.

LADDERWAY. The series of ladders giving ingress and egress to a mine shaft; the compartment in which the ladders are.

LAGGING. Timber, usually of small diameter, placed over the cap-timbers of incline shafts and drifts, to prevent damage from falling rock.

LAMINAE. Thin plates.

LANDER. The man at the mouth of the shaft, who receives signals from below, and attends to the unloading of rock sent up in buckets, skips or cages.

LAUNDER. A wooden flume or sluice, used to convey water, or tailings held in solution in water.

LAVA. Rock formed by flows from volcanoes.

LEACH. To dissolve minerals from ore by water.

LEACHING. Lixiviating ores.

LEAD (lead). A mineral body.

LEDGE. The solid rock where encountered at or nearest surface.

LEG-PIECE. An upright timber supporting the cap of a timber set.

LEGS. The side pieces of a set of timber.

LENSE. An ore body of lenticular form.

LENTICULAR. Having the shape of a double convex lense.

LEVEL. A horizontal opening in a mine. Levels are commonly opened at stated intervals as depth is gained—usually at 100 feet in modern mining practice. The word "level" is frequently used interchangeably with the word drift, but is more comprehensive. Both drifts and crosscuts may be opened on a level, but a crosscut is not a level.

LIGNEOUS. Of a woody nature.

LIMESTONE. Calcium carbonate.

LIXIVIATION. The process of leaching out mineral values from ores.

LODE. A stratified rock bed carrying mineral values.

LONG TON. A gross ton of 2,240 pounds avordupois.

MAGMA. Gangue. Rock material carrying ores.

MALLEABLE. Capable of changing form, without breaking, under a hammer.

MAN-CAR. A skip-truck having tiers of circus seats, used for carrying miners to and from work in mines operating inclined shafts.

MAN-ENGINE. An appliance for raising and lowering miners in deep incline shafts. Consists essentially of two long beams, worked in counter-balance and having platforms at stated intervals.

MASS. A solid chunk of native metal.

MASSIVE. Rock without defined lines of cleavage.

MATRICE. The rock surrounding an imbedded object, such as a nugget or mass of native copper.

MATRIX. Matrice.

MATTE. Regulus. A product between copper ore and blister copper, varying greatly in the percentage of metal contained. Is obtained by roasting out more or less sulphur from sulphide copper ores.

MATTING. The process of converting sulphide ores into matte.

MESA. Spanish for a tableland or plateau.

MESH. The size of openings in a screen.

METALLIFEROUS. Carrying metal.

METALLURGY. Science and practice of reducing metals from ores and minerals.

METAMORPHIC. When said of minerals refers to a rock that has undergone structural and chemical changes after its original formation.

METRE. A linear measure equalling 39.37 inches.

METRIC TON. A weight of 2204.6 pounds avordupois.

MILLING. Dressing ore in a mill; also running ore in a mine through a winze for loading into tram-cars or wheelbarrows on a lower level than the one where broken.

MILL RUN. A test of the mineral contents of rock or ore by actual milling.

MINE. An open pit, or underground opening or openings from which mineral values are extracted.

MINER. In strict construction, the man that does the drilling and blasting in a mine. In a broader sense, all men working underground.

MINERAL. Ore, or rock containing metal. In the Lake Superior district the term mineral has a special use, being employed to designate the native copper, with its adhering gangue of amygdaloid or conglomerate rock, as it comes from the mill, before sending to the smelter.

MINERAL BELT. The mineralized territory in a given formation or district.

MINERAL DE COBRE. Copper matte.

MINERALOGY. The science of minerals.

MINERAL RIGHTS. The ownership of the rights to mine under the surface of land. Mineral rights are sometimes reserved in selling the surface of land, in some districts.

MINER'S INCH. The amount of water that will flow through an open-

ing one inch square under a six-inch head, which is 2,274 cubic feet in 24 hours, or 94¼ cubic feet per hour, equal to 665 wine gallons, or 593 imperial gallons hourly.

MISSED HOLE. A drill hole, charged with explosives which fail to be set off by the fulminating cap.

MOIL. A steel bar, like a drill, except that it is sharpened to a point instead of having a cutting face.

MOLDS. Copper cast in molds.

MORAINE. A mass of boulders and detrital material marking the limits of a former glacier.

MORTAR. An assayer's mortar in which rock or ore is crushed with a pestle; a mortar box.

MORTAR BOX. The iron box under the stamps, into which ore or rock is fed for crushing.

MUCKER. A trammer.

MUNDIC. Pyrite; sulphide of iron.

NATIVE. A virgin metal—not an ore.

NON-CONFORMABLE. Rock strata evidently not originally associated in the position now occupied.

NUGGET. A lump of native metal. Term usually applied to gold.

OPEN-CAST. Working a mine as a quarry, without underground openings.

OPEN CUT. A mine worked open-cast.

ORE. A chemical union of one or more metallic elements with other elements, usually non-metallic, of which oxygen, carbon and sulphur are the most frequent. For the various ores of copper, see chapter on chemistry and mineralogy.

ORE CAR. A mine car for carrying ore or waste rock.

ORE DUMP. See Dump.

ORTHOCLASE. Silicate of potassium and aluminum. An acid feldspar.

OUTCROP. The ledge of a lode or vein that is exposed on the surface of the earth.

OUTLIER. An isolated rock or group of rocks lying at a distance from the main body, and separated therefrom, on the surface of the earth, by a different rock formation.

OUTPUT. Production.

OVERBURDEN. Superincumbent material, usually drift or alluvium.

OVERHAND STOPING. Removing ore in ascending steps.

OXIDATION. Process of conversion of metals or ores into oxides by weathering.

OXIDE. An ore of any metal or metals chemically united with oxygen.

OXIDIZED. United with oxygen. Many minerals and most metals oxidize with greater or less rapidity when exposed to air or water.

PARE. Cornish for a gang or shift of miners.

PARTING. The separation of two or more metals mechanically ad-

mixed, by electrolysis, cupellation, use of acids or other chemical or metallurgical processes.

PASS. A winze.

PATENTED. A mining claim is patented when the government executes a deed or patent to the holder.

PENTHOUSE. A shed-roof erected in the bottom of a shaft, when sinking, to protect miners from accidental fall of rock, timber or tools from above.

PENTICE. An erroneous spelling of penthouse.

PEROXIDE. The oxide of any metal containing the greatest proportion of oxygen.

PERPENDICULAR SHAFT. A shaft sunk vertically.

PERTENENCIA. One mineral claim in Mexico; area, one hectare, or 2,471 acres.

PETERING. Pinching.

PETER OUT. To pinch out.

PETROGRAPHY. The science of rocks.

PHOSPHATE. An ore of any metal or metals with which phosphorous and oxygen are chemically united.

PICK. A pick ax.

PICUL. A Chinese weight of $133\frac{1}{4}$ pounds.

PILLAR. A section of rock or ore left in place to support shafts or roofs.

PINCHING. The narrowing of a vein.

PINCHING OUT. The narrowing of a vein to extinction.

PIT. An opening in the earth's surface, usually shallow.

PITCH. Synonymous with "dip," but occasionally used to designate the angle of decline from the horizon measured along the strike of the lode or vein.

PITCHING. The irregular descent of a vein.

PLAIN. A flat, champaign country.

PLANT. The machinery equipment of a mine or reduction works. In general use the term includes buildings housing machinery.

PLAT. The enlargement of a shaft at a level, to give extra space for loading and unloading the cage, skip or bucket.

PLATEAU. A flat table land, similar to a prairie, but at a higher elevation.

PLUTONIAN. Volcanic.

PLUTONIC. Rock strata of volcanic origin overlaid at some time by later beds.

POCKET. Underground, an ore deposit, usually of small extent. On surface, a bin at shaft house or mill, in which ore is stored.

POCKETTY. Where a mineral body carries values very irregularly, in spots, it is said to be pocketty.

POLL-PICK. A tool having a pick on one end, and a poll, or hammer head, on the other.

POOD. A Russian weight of 36.112 pounds avordupois.

- POPPET-HEAD.** Framework over a shaft for a sheave-wheel.
- POWER-DRILL.** A machine for drilling holes in rock, actuated by compressed air, steam or electricity.
- PRILL.** Cornish for selected ore secured by cobbing.
- PRIMARY.** The oldest rock formations.
- PROP.** A heavy timber placed with its foot against the floor of a mine opening and its top against the roof, to support the rock above.
- PROSPECT.** To seek for mineral: a new mining property that has not yet earned the right to be called a mine.
- PROSPECTING.** Exploratory work for mineral, on property where no regular mine has been opened.
- PROSPECTOR.** A searcher for mineral.
- PROTOXIDE.** The oxide of any metal containing the least proportion of oxygen.
- PUDDINGSTONE.** A coarse conglomerate showing rounded pebbles.
- PULLEY-STAND.** A temporary tripod or other light frame construction, holding a pulley, over which the rope used in hoisting is passed.
- PULP.** Wet, concentrated ores.
- PULVERIZE.** To crush to a powder.
- PYRRHOTITE.** Magnetic iron sulphide.
- PYRITE.** Iron disulphide.
- PYRITES.** Sulphide ores; pyrite.
- PYROGNOSTICS.** Characteristics of a mineral under the blowpipe.
- QUARRY.** An open pit, of varying size, sometimes several acres in area, from which stone or ore is mined.
- QUARTER-SECTION.** A quarter of a square mile of land; 160 acres laid out in a parallelogram, each side of which is one half mile in length.
- QUARTZ.** Silica. Dioxide of silicon, frequently containing traces of iron and other minerals, and often the gangue of gold and other metals.
- QUARTZITE.** An oxide of silicon, with other minerals in varying quantities, partly granular and partly crystalline in structure.
- QUARTZOSE.** Rock having much quartz in its composition.
- RAGGING.** Cornish for rough cobbing; middle sized broken lumps of ore.
- RAISE.** A shaft or winze that is being opened from below. Sometimes called upraise or uprise.
- RANGE.** A mineral belt, also in many American states a surveyor's term for describing and locating lands. The state is surveyed in sections (with their subdivisions), towns and ranges. A town (or township) comprises 36 sections and is a square of six miles. Each township receives a double number, one for the town and one for the range. The towns are numbered consecutively from south to north and the ranges are similarly numbered from east to west.
- RAW ORE.** Ore before treatment.
- REAMER.** A tool like a bit, used to enlarge a hole previously drilled.
- REDUCTION.** The separation of metals from their ores.

REEF. A stratified mineral-bearing rock formation.

REFINING. The elimination of impurities from crude metals, or separation of metallic alloys obtained in the reduction of ores.

REFRACTORY. A refractory ore is one that cannot be smelted by ordinary metallurgical processes. A refractory stamp-rock is one that is pulverized with unusual difficulty.

REGULUS. Copper matte.

RESERVES. Bodies of mineral-bearing ground opened in a mine ahead of immediate requirements.

REVERBERATORY FURNACE. A smelting furnace in which the flame from the grate is reflected back on the charge of ore by the roof.

RISE. A raise.

ROASTING. Driving off sulphur and other similar volatile elements from ore by heating. When done in a furnace under great heat, the process is called calcining.

ROASTING FURNACE. An oven for the expulsion of sulphur, arsenic and other volatile elements from ore.

ROB. A mine is robbed when its pillars and other supports are removed for their mineral values, regardless of the future of the property. Done only by unprincipled persons or when the mine is about to be abandoned.

ROCK. Stone.

ROCK BURROW. A pile of refuse rock from a mine.

ROCK CAR. An ore car.

ROCK-CRUSHER. A machine for reducing rock or ore to smaller sizes. Crushers are of two types, the jaw-crusher and the centrifugal. The jaw-crusher works as a man cracks nuts with his teeth, the centrifugal operates on the plan of a coffee-grinder.

ROCK-DUMP. The place where worthless rock is piled.

ROCK-FILLING. Waste rock placed in worked-out stopes as a support for the roof.

ROCK-HOUSE. A building where copper-bearing rock is received and put through crushers before shipment to the mill. Is really a preparatory mill. Is usually built in connection with a shaft house.

ROLLING. In its descent, a lode or vein, while fairly constant to a given angle on the average, frequently makes depth at irregular angles. This is called rolling.

ROLLS. Heavy steel rollers, worked in pairs like a clothes-wringer, used for crushing rock and ore.

ROOF. The rock above a mine opening.

ROOM. Similar to a stope; term usually applied to mines working mineral bodies lying nearly horizontally.

ROYALTY. A percentage paid to the fee-owner from mineral values obtained by the lessee of a mine.

RULE-OF-THUMB. The guess-work and rough measurement plan of mining, in contradistinction to systematic development from data obtained by careful surveying and engineering.

RUN. When superincumbent material is coming into mine openings, the ground is said to be running.

SADDLE. An anticlinal.

SAFETY CAGE. A cage furnished with automatic appliances to stop its descent in case the cable breaks. Usually works well in theory.

SALT. A chemical union of an acid with a base.

SALTING. Placing foreign ore in a mine to deceive intending purchasers or other interested parties.

SAMPLE. A specimen of ore—usually not the worst to be found in the mine.

SAND PUMP. A pump, usually centrifugal, designed to lift water carrying large quantities of coarse tailings.

SANDS. Tailings from the stamp mills of Lake Superior copper mines.

SAND SHAFT. A shaft sunk through sand.

SAND WHEEL. A large wheel, having buckets on its inner perimeter, for elevating water carrying stamp sand.

SCALE COPPER. Copper in very thin flakes.

SCHIST. A metamorphic slaty rock of foliated structure.

SCHISTOSE. Approximating to schist.

SCORIA. The slaty, porous portion of a lava flow; slags from copper smelters.

SCRAM. A mine that is being gone through carefully, when apparently worked out, for mineral previously overlooked; to scam.

SCRAMMING. Searching a mine for mineral previously overlooked.

SCREEN. A grating of perforated metal or woven wire.

SEAM. A thin layer of rock or ore.

SECONDARY. Rock strata of the second period.

SECTILE. That which may be cut easily.

SECTION. A field or district; also, in the United States of America, a square mile of land.

SECTION POST. A boundary mark set at section corners by surveyors.

SEDIMENTARY. Rocks formed by deposition from water, as distinguished from rocks formed by igneous action.

SELVEGE. Fluccan.

SET. A framed set of timber used for supporting ground in a mine.

SHAFT. A downward opening into a mine, with its upper end at surface.

SHAFT-HOUSE. A building at the mouth of a shaft, where ore or rock is landed from below.

SHALE. An argillaceous slate, of fissile structure.

SHEAVE. A grooved wheel, notched to carry rope. An open pulley.

SHIFT. A miner's turn, of eight to ten hours' work; a force of men employed on one turn.

SHIFT-BOSS. A mine boss or under captain in charge of one gang or party of miners.

SHOE. A stampshoe.

SHOOT. A chute.

SHORT TON. A weight of 2,000 pounds avordupois.

SHOT. A blast of some explosive.

SHOT COPPER. Small rounded nodules of native copper, somewhat resembling small shot in size and shape.

SHUTE. A chute.

SILICA. Dioxide of silicon; quartz.

SILICATE. An ore of any metal or metals chemically united with silica.

SILL. The floor-piece of a set of mine timber.

SINKING. The process of deepening a shaft or winze.

SINKING-PUMP. A pump, usually vertical, secured to a platform, and lowered as required, as the shafts are deepened.

SKIP. An iron box, open at the top, running on four wheels, and hauled by a cable, used in incline shafts for hoisting ore and rock and lowering timber.

SKIP-ROAD. A track of T-rails spiked to wooden sleepers, on which the skip runs.

SKIP-WAY. A skip-road.

SLAG. The vitreous refuse matter from a smelting-furnace.

SLICING. When mine pillars are removed the work is called slicing down.

SLICKENSIDES. A polished rock surface showing striations produced by movement of adjoining rocks under great pressure.

SLIDE. A dissociation of strata caused by the subsidence of the overlying rock formation.

SLIMES. Exceedingly small particles of rock and mineral held in solution in water, making a slimy mixture.

SLIME TABLE. A circular revolving table whereon slimes are worked, and the minute particles of mineral saved.

SLIP. A fault where a superincumbent stratum has slid downwards.

SLUDGE. Mixed rock and water, brought to surface where a diamond drill cuts through very soft rock; also, the tailings from a concentrator or mill.

SLUICE. A wooden flume or launder.

SMEILTER. Works where ores or crude metals are freed from gangue or chemically united elements by heat.

SMELTING. The reduction of ores and crude metals in furnaces by heat, fuel and fluxing material being added to the material to be smelted.

SMEELTS. A smelting plant.

SOAPSTONE. Steatite.

SOLLAR. A platform in a shaft.

SPATHIC. Having a form approximating that of feldspar.

SPILL. Lagging driven ahead of the regular timbering in treacherous ground.

SPITZKASTEN. German for a pyramidal box, wherein ores are concentrated and sized by a jet of water fed from below.

SPOON. A long-handled spoon used to scrape out drill holes.

SQUARE SETS. A form of mine timbering with mortised and tenoned mill, top piece and uprights of equal length, joined at right angles.

SQUIB. A fuse.

STACK. The chimney of a furnace; usually employed to designate a number of furnaces, when used in the plural.

STAMP-MILL. A mill for crushing and concentrating minerals.

STAMP-ROCK. Rock containing fine copper that can be secured by stamping.

STAMPS. Machines to crush rock or ore by heavy blows.

STAMP-SHOE. The heavy chilled iron casting attached to the lower end of a stamp piston that does the actual crushing of rock in a stamp mill.

STATION. A chamber in a shaft, cut out for pumps, etc.

STEAM-HAMMER. A heavy hammer actuated by steam or compressed air.

STEAM-STAMP. A stamp actuated by steam.

STEATITE. Soapstone. A greasy mineral, having a talc base.

STEP FAULT. A series of faults, rising like steps.

STOCKWERK. Country rock penetrated by numerous small stringers of ore, the entire mass averaging sufficiently rich to permit its mining and treatment.

STOPE. Used interchangeably to designate the excavation above a drift, or the pay rock remaining unmined above a drift.

STOPING. Breaking down the mass of pay rock or ore above a drift. When stoping in an ore body of average width, miners can break rock much more quickly and cheaply than when driving the drifts, which are usually about 7x7 feet in size.

STOPING GROUND. Ground in reserve, opened by drifts, and ready for breaking down.

STRATA. The successive rock layers of the earth.

STRATIFIED. Having regular layers of varying rock formation.

STRATUM. A layer or bed of rock.

STREAK. The color given by a mineral when scratched.

STRIKE. The horizontal trend of a mineral body, measured by the points of the compass.

STRINGER. A thin seam of ore.

STRIPPING. (v). Uncovering a lode, vein or bed of mineral, by removing the superincumbent earth; (n). the drift or alluvial soil overlying an ore body.

STRUCTURE. The form of a mineral, such as granular, crystalline or amorphous.

STUDDLE. A prop in a mine.

STULL. The top piece of a set of mine timber.

SULPHATE. An ore of any metal or metals with which sulphur and water are chemically united.

SULPHIDE. An ore of any metal or metals with which sulphur is chemically united. Sometimes called a sulphuret.

SULPHOANTIMONIDE. An ore of any metal or metals with which sulphur and antimony are chemically united.

SULPHOARSENIDE. An ore of any metal or metals with which sulphur and arsenic are chemically united.

SULPHURET. A sulphide. Term becoming obsolete.

SUMP. The bottom of a shaft, where water collects.

SURFACE CAPTAIN. A mine superintendent whose duties are wholly on surface.

SURFACE RIGHTS. The ownership of the surface of land only, where mineral rights are reserved.

SWABSTICK. A stick used to clean out drill-holes.

SYNCLINAL. A trough formed by rock strata that are low in the center and high on the sides. Reverse of an anticlinal.

TABLE. An ore concentrator, of which there are various forms.

TAILINGS. Refuse matter from a stamp mill.

TAMPING. Closely packing clay or other sticky earth into a drill-hole above the cartridges, to give greater force to the blast.

TAPER OFF. Cornish for stopping work temporarily.

TELERA. Spanish for a roast-heap of sulphide ore.

TENSILE STRENGTH. The resistance to breaking or elongation offered by metal when under strain from either end.

TERRERO. Spanish for waste burrows.

TERTIARY. Rocks of comparatively recent formation, as time is measured by geological periods.

TEST-PIT. A shallow pit sunk to discover mineral.

THROW. The vertical displacement of a vein caused by faulting.

TIMBER. The wooden beams and sticks used for underground supports.

TIMBER-BOSS. The head timberman.

TIMBERMAN. One who works at timbering a mine.

TON. See Metric, Long and Short tons.

TONELADA. Spanish for ton.

TOSSING. Jigging finely comminuted ore.

TOWN. See Range for description.

TRACHYTE. A micaceous hornblende and feldspar rock.

TRAM. To load rock or ore in tram-cars and push same to the shaft; a tramway.

TRAM-CAR. A car running underground on light T-rails, used for carrying rock from the stopes and other workings to the shafts.

TRAMMERS. Men who load and tram the broken rock underground.

TRAP. A dense gray, blue or greenish rock of volcanic origin; of considerable variety in different beds, but usually of feldspathic-augitic nature.

TRAPPEAN. Pertaining to trap rock.

TREND. The general direction of a mineral body.

TRESTLE. A frame-work of timbers, connecting various mine and mill buildings on surface, usually carrying tram-tracks.

TRIBUTE. The royalty or percentage paid by workmen to owners for the privilege of working a mine. Apt to be a form of grand larceny, at the expense of the mine's future.

TRIBUTOR. One who works a mine on tribute.

TRIPOD. The three-legged iron frame on which the working parts of a power-drill rest.

TROLLEY-CABLE. A wire rope sometimes used in an incline shaft as a guide for the bucket.

TROUBLED. A vein is troubled when disturbed or faulted.

TSUBO. Japanese measure of six feet square, equalling 36 square feet.

TUFA. (Calcareous). A porous limestone;(volcanic). Loosely cemented ash and scoria from a volcano.

TURBINE. The most efficient form of water-wheel.

TUTWORK. Development work.

UNCONFORMABLE. Rock strata that do not correspond as to bedding, horizons or geological age.

UNDERHAND STOPING. Removing ore in descending steps.

UNDERLAY. The mineral bodies lying under a given tract, though not outcropping on surface.

UNPATENTED. Mining claims held from the United States Government subject to annual assessment work.

UNSTRATIFIED. Rock forms not bedded in layers.

UNWATER. To free from water; to pump out.

UPCAST. A shaft having an upward air current.

UPRAISE. A raise.

VAN. To dress ore.

VANNER. A jig for dressing ore by means of vibratory motion, aided by jets of water to carry away gangue-rock.

VARA. A Spanish-American measure of 33 inches.

VEIN. A mineral body having defined walls. See contact vein and fissure vein.

VEINSTUFF. Ore with its associated gangue.

VENTILATION. The system of natural or artificial air currents in a mine. See air-shaft.

VERTICAL. Perpendicular. Upright and downright.

VERTICAL SHAFT. One sunk at an angle of 90° with the horizon, or directly downwards toward the center of the earth.

VINNEY. Cornish for copper ore with a green coating caused by weathering.

VIRGIN. Native metal, as distinguished from ores; which are chemical compounds.

VITREOUS. Of a glassy nature.

VOLATILE. That which can be driven off as vapor, by heat.

VUG. A druse. A hollow, or cave, entirely surrounded by rock. Usually shows fine crystallizations.

WALL. Rock of a different formation adjoining a vein or other ore body.

WATER DRILL. A power drill in which a current of water runs through the bit of the drill, changing the rock dust from the bit into sludge which is expelled from the bore-hole by the force of the current.

WATER JACKETED FURNACE. A smelting furnace provided with an outer jacket, between which and the furnace proper water is circulated.

WATER LEVEL. The point above which water does not rise when a mine is allowed to fill.

WEATHERED. Rock altered in structure by exposure to air and water.

WET PROCESSES. Leaching processes; lixiviation.

WHEAL. Cornish for mine. Synonymous with bal.

WHIM. A windlass with a horizontal drum.

WHIP. A rope and fixed pulley or pulleys, for hoisting.

WILFLEY. A Wilfley concentrating table.

WINCH. A windlass.

WINDLASS. A winding device for hoisting from a pit or shaft, by means of coiling a rope or cable around a drum.

WIRE BARS. Refined copper cast into bars for wire drawing.

WORKINGS. The underground openings of a mine.

YELLOW COPPER ORE. Chalcopyrite.

ZINC BLENDE. Sphalerite. Sulphide of zinc.

CHAPTER VII.

COPPER DEPOSITS OF THE UNITED STATES.

In this chapter will be found synopses of the principal features of interest, scientifically and commercially, of the copper deposits of the United States, arranged by states and territories, in alphabetical order.

ALABAMA. This state possesses deposits of chalcopyrite ore occurring as veins in igneous rocks, in Cleburne and Randolph counties. The upper portions of at least two of these veins carried good values in oxide and carbonate ores, with some associated gold and silver values, and occasional sheets of native copper. Two mines were worked quite extensively in the seventies. These were closed when the altered ores were replaced at depth by sulphides. There has recently been some revival of interest in Alabama copper ores, which, so far as known, are confined to the northwestern corner of the state, and some development work is now under way.

ALASKA. In giving consideration to the mineral deposits of Alaska, it must be borne in mind that this territory is an empire in itself, having a greater area than France and Germany combined. The copper deposits, known and partially prospected, are scattered over a vast territory, and occur under such varying geological and geographical conditions that comments pertinent to one district might be entirely inapplicable to another. Alaskan copper deposits cannot be considered as one district, but as a number of separate fields, with all the distinctions implied thereby.

It may be said, in a general way, that there is much copper in Alaska. It may also be said that there are many and able liars in Alaska. There is little question that the various placer gold camps of interior Alaska and the Yukon have been systematically boomed by an organized clique, to the benefit of sundry transportation lines and outfitting firms. Many of the press despatches have been of a misleading nature, and there are evidences that similar systematic promotion of a copper mining boom is being attempted. This is not intended to apply to the local newspapers of Alaska, but to certain not always veracious correspondents, and to various newspapers along the Pacific coast. This criticism will doubtless bring forth warm expostulations, and perhaps the author will be accused of attempting to deliberately injure a new and promising copper field, though such is not the case. There is every likelihood that good copper mines will be opened in Alaska. In fact, several now opening are of more than ordinary promise, but there has been so much of exaggeration, of misrepresentation and of downright lying, about Alaskan copper deposits, that the reported finds of mountains of pure copper must be taken *cum grano salis*. The bogus mine

promoter always finds his most profitable field in a district far from centers of population and difficult of access. Ten years ago Arizona was filled with wildcat mines and mining fakers of all grades, and they gave that territory a very bad reputation among investors. This bad state of affairs has been greatly ameliorated of late, and while there are still salted mines and mine salters in Arizona, the standard of mining and mine promotion has been greatly raised in the past few years, as the district has become more accessible and better known. Alaska is today where Arizona was ten years ago—a *terra incognita*, where all things are possible, and a country of such magnificent distances that the natural-born liar finds opportunities of outdoing his own best records. There are fine copper mines awaiting opening in Alaska, but there are also cleverly made bogus gold bricks awaiting purchasers. The country undoubtedly offers great opportunities to investors with the capital, skill and business sense required for successful mining in any part of the world, but common business prudence dictates careful examination by competent experts before the investment of money. All legitimate mining districts court this sort of investigation.

Copper is reported as occurring at many points in Alaska, prominent among which are the valleys of the Copper, White, Chitna and Tanana rivers; on Latouche and Prince of Wales islands, along the Mt. St. Elias range; at various inland points in the Ketchikan district; on the Scolai range; at Sunrise, and elsewhere. Alaska is a hilly and often mountainous country, except along the tundra of the Arctic circle, and the valleys of the large rivers, often five to thirty miles in width, are the natural highways for prospectors, hence it arises that mineral discoveries are first reported from them, in the interior districts.

The copper fields of the Copper river and its principal tributaries have attracted the widest attention, though the most important developments are along the coast. The Copper river basin, with the valleys of its tributary rivers, is a vast field, and will require many years for even a fairly complete preliminary examination. This basin is a broad synclinalorium, the central part of which is occupied by the Wrangell Mountains, which are of Tertiary age. Copper ores are reported from many points along the valley of the Chitna and between that river and Mt. Wrangell.

The White river is a tributary of the Yukon, with a generally northerly trend. Kletsan creek, a small tributary of the upper White, has excited much interest, because of the occurrence of native copper, which has been gathered and used by the natives for arrow-heads, bullets and ornaments. Scolai Pass is the divide between the head waters of the White and Chitna rivers. Mr. James Lindsay, a well-known consulting engineer of Portland, Ore., spent the spring and summer of 1902 in Alaska, and made a very careful examination of the upper White river copper fields. He informs me that the much-talked-of Kletsan creek is apparently of little importance as a possible future source of copper supply. The native copper occurs in placer form only, and has evidently been derived from ancient basaltic dikes intersecting greenstone diorite and carboniferous limestone. The river valley

for a hundred miles east from Scolai Pass is covered with volcanic ash, which is over 100 feet deep at the international boundary line on the White river. This volcanic ash meets the perpetual snow and ice at an altitude of 6,000 feet on the mountains, and the cupriferous veins are most effectually hidden by the scoria or by the everlasting ice and snow, affording about as discouraging a prospect for exploration as could be found at any point on the globe. The United States Geological Survey reports that the largest placer nuggets of copper in the Kletsan creek valley weigh eight to ten pounds, and that investigation disclosed the original home of the placer copper to be in the greenstones, which were traversed by irregular joints, in which calcite was deposited, and these were found to carry copper, the veins so found being small and of no commercial value. All of the cupriferous veins were in contact with the limestone. In the same neighborhood are trappean amygdaloids carrying amygdules of chalcopyrite.

Discoveries of native copper, bornite and chalcopyrite are reported from the Kotsina river. Near the Kuskulana river a mass of native copper, three feet wide and eight feet long, was found.

On the islands and mainland in the Prince William's Sound district a number of promising properties have been opened, one of the most advanced being on Latouche Island. The Alaska Central railroad is to run from Valdez, at the head of Resurrection Bay, on Prince William's Sound, to Rampart, on the Yukon river, near the Arctic circle and international boundary line. Preliminary surveys have been made and while the exact route of the line is not fully determined at all points, the road will run along the valley of the Copper river from Copper Center to Mentasta Pass, thence northwesterly, crossing the upper Tanana to the Yukon, a distance of approximately 400 miles. This railroad will traverse several promising mineral districts, and its construction seems assured.

At the present time the most important copper district of Alaska is in the vicinity of Ketchikan, in southern Alaska. On Prince of Wales Island several mines are being opened on veins of sulphide ore that are apparently of good width and permanence, and which carry gold and silver as well as fair percentages of copper. This district has the advantage of tide-water, giving cheap and fairly rapid communication with the cities of Puget Sound and the Pacific coast of the United States. It is quite certain that the first regularly producing copper mines of Alaska will be developed here, and some of them should become factors in the world's production during the present year.

ARIZONA. Arizona is the third district of the United States and the fourth in the world in point of productive capacity. No other copper field has shown such marked gains in production during the past decade, and there is every reason to believe that the output will continue to increase for many years to come.

Arizona has nearly a quarter of the copper mines of the United States. Many of them are of very doubtful value; a few are of fully demonstrated worth, and a considerable number give promise of becoming both

large and profitable producers. The mere fact that a copper mine is located in Arizona should not prejudice opinion for or against it. Some of the best and some of the worst mines ever opened are in this territory, and each mine should be judged individually, upon its merits.

There are evidences of rude mining by prehistoric peoples at a number of points in the territory, but no traces of smelting, and had the copper ores been reduced, the slags, and possibly remnants of the furnaces, could hardly have escaped attention in modern days. It seems likely that the iron ochres, malachite and azurite were mined in a crude way, for pigments. Prehistoric turquoise mines have been found at several points, notably in the Dragoon Mountain range.

The first copper made in Arizona was turned out of an adobe furnace at the Longfellow mine, Clifton, in 1873. The nearest railroad point was 800 miles distant at that time. The development of the mineral resources of the territory of Arizona has been a remarkable one, during the three decades that have since elapsed.

The copper zone of Arizona, broadly speaking, has a general southeasterly and northwesterly trend, and the copper deposits, as a rule, are found along the contacts of igneous rocks, such as porphyry and diorite, with limestone of the Paleozoic group, mostly of the carboniferous series. The general geological conditions of Arizona are much the same as in the adjoining Mexican state of Sonora.

Copper ores are found in more or less profusion in every county of the territory. The counties are of princely size, and as the topography ranges from hilly to mountainous in most parts, not even the best known districts have been developed yet, or even fully prospected. Nearly all of the ores of copper are found in Arizona, and native copper is of not uncommon occurrence, especially in the mines at Clifton and Bisbee. The principal copper districts are four in number, as follows: Bisbee, in Cochise county, only six miles from the Mexican border; Jerome, Yavapai county, in the northwestern part of the state; Clifton, including Morenci, in Graham county, north of Bisbee and close to the New Mexican border; Globe, Pinal county, not far from the center of the territory. In addition to these four principal districts, all of which are considerable producers, in about the order given, there are a dozen or more smaller districts, such as the Helvetia, in Pima county; the Wickenburg, and others.

The Bisbee district, of which the town of that name is the center, is really a part, geographically, of the great Sonoran copper belt of Mexico. The ore deposits occur in carboniferous limestones, bedded in nearly horizontal planes, and underlaid by quartzite. The veins are notable for the quantity of fluccan along the walls, and are easily mined as a rule. The clay carries considerable finely comminuted native copper and masses of native metal of respectable size are occasionally encountered. The oxidized zone extends to a depth of perhaps 400 feet and is succeeded by unaltered iron-copper sulphides that average excellent values. The oxidized zone is notable for the richness and extent of its high-grade carbonate ores.

The country rock of the Jerome district is slate, extensively intruded by dioritic igneous rocks, slates and diorites having a capping of uncomformable limestones of later age and devoid of copper. There is a limited zone of oxidized ores, but the principal dependence is placed upon the unaltered disseminated sulphides. These are by no means remarkable for their high percentages of copper, but are notable for their great extent and the high values carried in gold and silver.

The Clifton district has quartzite and limestones superimposed on granite, with intrusive igneous rocks of both basic and acid types, the entire formation being greatly faulted. Ore occurs in both the eruptive rocks and the limestones. It was in this district that the first Arizona copper mining was done, three decades ago. There were very extensive deposits of rich oxidized ores near the surface, along the contacts between the porphyry and magnesian limestone. These ores were self-fluxing and highly profitable but gave out at shallow depth, and, contrary to the usual rule, were not succeeded by sulphides. Extensive openings, on the porphyry of Humboldt Mountain, have developed enormous beds of low-grade sulphides, during the past ten years, and these are now the mainstay of the district, though some carbonate ores are still mined. The leaching process, little used in the United States, is employed to advantage in the treatment of certain of the low-grade ores of this district.

The first mining in the Globe district was done in 1876, and was for silver. The Old Dominion, the principal producer and a typical mine of this field, is opened on a contact vein between a diorite foot and a hanging of carboniferous limestone, over the greater part of which there is a trachyte capping. The principal ore bodies are in the limestone, and the ores are mostly oxidized. A peculiar feature is the presence of a sulphide zone which has oxidized ores both above and below. The ores are highly silicious and require heavy fluxing with iron and lime. The lack of sulphide ores, to furnish the iron needed in fluxing, is one of the most serious drawbacks of this district. It seems likely that ample bodies of unaltered sulphides will be found at some future time, in or adjacent to this district, where operations are further handicapped by very high freight rates on coke and other supplies.

Political expediency should not be allowed to longer prevent the admission of the territory of Arizona into the sisterhood of states. The territory has the population, resources and assured future that are necessary requisites of statehood, and should no longer be kept in leading strings, when both able and willing to conduct its own affairs as an independent commonwealth.

ARKANSAS. Tetrahedrite and tennantite occur in the Kellogg mine, Pulaski county, only ten miles north of Little Rock, the capital of the state. These are not commonly considered as commercial ores of copper, owing to their refractory nature and the highly deleterious effects of both antimony and bismuth upon finished copper, even in small amounts. Antimonies!

and bismuthiferous ores are rarely worked, unless carrying considerable values in silver, as is the case at Butte, in Algeria, and at other points.

CALIFORNIA. There are few states in the American union more richly endowed with copper than California. To give the names of all the counties in which copper is mined or found would be nearly equivalent to calling the roster of the state, as there are but few in which ores of the metal are not found in more or less profusion.

It may be said, in a general way, that there are two copper belts in the state, one following the Coast Range mountains, while the other is found in the foothills of the Sierras. Both belts have a north and south trend, and extend through practically the entire state. The Sierran belt reaches from Oregon on the north, through the counties of Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Madera, Fresno, Tulare, Kern, Los Angeles, San Bernardino, and Riverside, to the Lower California line. The Coast Range belt extends from Del Norte to San Diego, across the state from north to south. In Kern county there is an apparent branching of the Sierran copper range, with an offshoot that traverses Inyo and San Bernardino counties, then enters the neighboring territory of Arizona, thus establishing a close geological and geographical connection between the copper measures of Arizona and California.

The Californian copper beds are found in close proximity to the gold-fields, and much of the copper ore carries considerable values in gold. In the northern part of the state the gold and copper veins are apparently interwoven. There are ample evidences of intense volcanic action in this section, and in Shasta and adjoining counties the copper deposits are almost invariably auriferous to a profitable extent.

The first Californian copper mining was done in 1860, at Copperopolis. Considerable ore was shipped to New York, Baltimore and Swansea for reduction, and in 1863-1866 no less than nine small smelters were built in the state, copper production reaching nearly 2,000,000 pounds in 1864. The great fall in price brought operations to a stop in 1867-68, and almost no copper mining was done after that time until 1895, when an English company bought the "worthless" Iron Mountain mine in Shasta county, and in seven years has made it one of the world's great copper producers.

Although there are several other districts of promise, Shasta county is the source of the principal production, and the scene of the greatest activity in the development of new mines. This belt is from half a mile to four miles wide, with an average width of perhaps less than two miles, and a proven length of about twenty miles, though possibly much longer. The belt has a crescent form, with the principal developments at the western end. The country rock is porphyry, with slate to the west and granite and quartzite to the east. The beds occur as mammoth, flat-lying lenses of low-grade auriferous sulphide ores of copper, usually capped by massive beds of gossan. One considerable body of silicious ore has been opened by the Mt. Shasta Gold Mines Corporation.

As a rule the alteration zone of Californian copper deposits is comparatively shallow. While the high-grade oxidized ores are found in large quantities at surface and for a little depth, the unaltered iron-sulphides usually come in at a depth of about one hundred feet, hence the big mines of the state will be, like the Mountain, low-grade mines operated on a very large scale.

Next to Shasta the copper producing counties of California rank in about the following order of importance: Calaveras, Fresno, San Bernardino, Kern, Mariposa, Madera, Merced, Stanislaus, Amador.

Native copper has been found at Napoleon, Calaveras county; at Cosumnes, Amador county, and elsewhere.

COLORADO. With the exception of an extensive plateau in the eastern part of the state, Colorado is heavily mineralized at nearly all points, and while gold and silver have been most extensively exploited, copper, iron and the other minerals exist in abundance in many parts. Copper ores are found in the counties of Boulder, Chaffee, Clear Creek, Custer, Gilpin, Gunnison, Hinsdale, Huerfano, Lake, La Plata, Ouray, Park, Pitkin, Rio Grande, San Juan, San Miguel, and Summit.

The production of refined copper by Colorado mines has run up into the thousands of tons for some years past, but almost without exception this has been secured as a by-product from the smelting of gold, silver and lead ores. The sulphide ores predominate and are found at many points. At present a number of copper mines are being opened, mainly in San Juan county near the New Mexico border, and in the northern part of the state near the Wyoming line.

CONNECTICUT. There are two copper mines in Connecticut, from which ore has been produced occasionally during the past century, these being the Newgate at Granby, and the Bristol in the town of that name, but both are idle at present. Malachite, bornite, chalcocite and chalcopyrite are found at Bristol; cuprite, malachite, chalcocite and bornite are found at Cheshire; chalcopyrite occurs at Middletown, New Britain, Roxbury, Bolton, Brookfield, Sunbury, Litchfield and other points, and native copper is found at Farmington in red sandstone. A 200-pound mass of native copper was found in alluvium near New Haven. Copper ore was also found near Montville in 1902.

DELAWARE. Chalcopyrite has been found in the quarries of the Wilmington Granite Co., on the Brandywine river, near Wilmington, but no workable deposits of copper ore are known to exist in this state.

FLORIDA. No important or workable bodies of copper ore are known to exist in this state, but small veins of sulphide ores have been found at several different points.

GEORGIA. Copper ores exist in the counties of Fannin, Lincoln and Rabun, and probably in other parts of Georgia. Considerable chalcopyrite

is found in Fannin county, at a point only two miles distant from the copper mines of Ducktown, Tennessee. At present there is but one active producer of copper in the state, this being the old Magruder mine, now owned by the Seminole Copper Co., but reopening work is being done at the Canton mine, and a small amount of work is under way at other points.

IDAHO. Although Idaho has never been a large producer of copper, the state possesses important deposits of ore at several points, and a large amount of development work is now under way. Copper ore is found in the counties of Alturas, Bringham, Custer, Idaho, Lemhi, Shoshone and Washington, and possibly elsewhere, as the entire state is richly endowed with metals, and the exploration and development of its mineral wealth has been by no means commensurate with the opportunities. The principal copper developments of the present are in Custer, Washington and Lemhi counties. The ores are mainly carbonates and sulphides, though other forms occur and native copper has been found in the sluice-boxes of the gold mines at Murray.

There was much interest aroused in the Seven Devils district a few years ago, but for some reason that does not seem quite clear, this district with the diabolical name has failed to develop any regular copper producers, though ore of the best grade has been found. Sooner or later there should be some good mines opened in this district.

The principal copper mining operations of the present are carried on in Custer county, by the White Knob company. A vast amount of work has been done at this point, and while the ore is of low grade it is hoped that the mining may prove profitable, by reason of operating on a great scale.

The Coeur d'Alene copper district is receiving some attention at present, and has a number of promising prospects. Although silver-lead mines have been operated for years in this district, it was not until 1898 that any attempt was made at copper mining. At present there is a considerable activity in this field, though none of the copper mines have passed beyond the stage of prospects.

ILLINOIS. Native copper, occurring as drift, in the alluvium, is of rather common occurrence in Illinois, but is, of course, of no commercial importance. The only deposits of copper ore in place known in the state are in Hardin and Chittenden counties. Chalcopryite has been found in fair quantities near Rosiclare, Hardin county, and during 1902 considerable copper was found, in connection with lead and spar, in Hardin and Chittenden counties, and an attempt was made at organizing a company to open a mine.

KANSAS. The rock strata of Kansas range from carboniferous to tertiary, but the igneous rocks are lacking, and without them there seems slight likelihood of discovering important copper deposits. A little chalcopryite in tetrahedral crystals has been taken from the lead and zinc mines of Galena, Cherokee county, in the southwestern corner of the state.

KENTUCKY. A little chalcopyrite has been found in Livingston and Union counties, but the deposits do not promise to be of any special value industrially.

LOUISIANA. No copper deposits of industrial importance are known in this state, but there is an interesting occurrence of chalcopyrite in a peak deposit of galena, sphalerite and baryte in halite (rock-salt) on Belle Isle, near the mouth of the Atchafalaya river.

MAINE. Some of the earliest copper mining in America was done in the Pine Tree state, and a smelter was built at Taineston previous to 1840. Chalcopyrite is found in the lead mines at Lubec, also near Dexter, and in Sullivan, Franklin, Hancock, Topsham, Parsonfield, Whiting and elsewhere. Chalcopyrite, chalcocite, bornite, cuprite and tetrahedrite occur at Blue Hill. There are old copper mines near Calais, on the New Brunswick border, and about 1880 there was a local copper boom that led to the opening of mines at Blue Hill and Sullivan, in Hancock county, but these did not prove profitable or long-lived.

MARYLAND. Copper mines were worked in this state in colonial days and during the first half of the nineteenth century. There are three cupriferos measures of some little extent, and the copper mines of Maryland were actually of some importance as producers, until the discovery and exploitation of the rich native metal mines of Lake Superior put a quietus on copper mining along the Atlantic seaboard.

The Maryland ores are mainly chalcopyrite and bornite, with occasional malachite. Of the three principal districts of the state, the most important is in Frederick county, running along the Linganore hills, from New London northward to a point beyond Libertytown, the ore occurring in slates and limestones. The second district, in Carroll county, is found mainly between Sykesville and Finksburg, with the ore in slates. The third district is in Baltimore county, at Bare Hills, where sulphide ores are found in hornblende gneiss.

MASSACHUSETTS. There is more or less copper at various points in the Old Bay State, and fitful attempts have been made at opening mines, but none have resulted from the short-lived operations. A little native copper is found in some of the triassic sandstone strata, and chalcopyrite is found in the lead mines at Southampton, also near Deerfield, at Turners Falls, Hatfield, Sterling, Rowe, Leverett, New Marlborough and Russell, also chalcopyrite and tetrahedrite at Newburyport. Prof. W. O. Crosby, of the Massachusetts Institute of Technology, furnishes me with particulars regarding the new copper prospect opened in western Massachusetts in 1902, a description of which will be found under the name of the New England Mining Co.

MICHIGAN. While the Keweenaw formation of Lake Superior outcrops in Wisconsin and Minnesota to the west, and upon the Canadian shore

of Lake Superior as well, the developed and productive mines of the district lie wholly within the limits of the state of Michigan. Copper ores are found in the granite lying north of the iron belt in Marquette county, and one mine is being developed thereon, but for all practical purposes the copper belt of Michigan is contained in the three counties of Keweenaw, Houghton and Ontonagon, stretching from east to west, from the point of the Keweenaw peninsula along the mainland of the western half of the southern shore of Lake Superior. There are also abandoned copper mines on Isle Royale, which is now practically uninhabited except in summer. The Keweenaw formation stretches through Gogebic county, and across the Wisconsin line into Minnesota, but there never have been any producing mines west of Ontonagon county.

The formation carrying the cupriferous lodes and veins of the Lake Superior district is composed of old lava flows, supplemented by beds of conglomerate formed by the deposition of rocks, broken from adjacent shores, upon old sea-beds. This belt of Keweenaw rocks, so called from its predominance in the Keweenaw Peninsula, where first noted by early geologists, is of considerable extent. It forms a trough, or synclinal, the southern edge outcropping on the Keweenaw Peninsula and to the westward along the southern shore of the lake, and it is with this southern edge that we have to do. The other outcrop of the rock strata forming this trough is noted on Isle Royale, and on the northern shore of the greater part of the western half of Lake Superior; also on the southern shore of the lake in Douglas county, Wisconsin, and again on Michipicoten island and the adjoining northern shore, at nearly the extreme eastern end of Lake Superior. The axial line of the synclinal seems to run somewhat north of east, but there is marked diversity in the trend of the southern outcrop where mining is actively prosecuted, the strike ranging from nearly due East and West to North 30° East in the Portage Lake district. Broadly speaking, Lake Superior rests in the trough of the Keweenaw series.

Discarding further consideration of the northern outcrop of the series, where the dip is to the southward, it may be said that the dip of all of the southern outcrop of the Keweenaw beds is to the northward or northwestward. The cupriferous strata on the Keweenaw peninsula have sandstone to either side. The underlying sandstone, to the east and south, is generally held to be unconformable with the traps of the Keweenaw group, and has been identified by Dr. L. L. Hubbard as of the Potsdam series. Copper is occasionally found in the eastern sandstone, near the point of contact with the trap, where evidences of igneous influence are quite plainly discernible; and in Ontonagon county fine copper has been found in the overlying sandstone conglomerate of the Porcupine mountains. The western sandstone is superimposed upon the Keweenaw beds and is apparently in place.

The outcrop of the Keweenaw formation, between the two sandstones, is from two to six miles wide, roughly speaking, and is narrowest where the dip of the strata is greatest, and widest where the strata dip least sharply. Toward the middle of the Keweenaw peninsula the western sandstone is lost under the lake, and at Bete Gris bay the eastern sandstone also plunges beneath

Lake Superior, leaving the traps and conglomerates in sole possession of the tip of the peninsula for the last ten miles, the waters covering the entire formation at the end of Keweenaw Point.

The Keweenawan series consists of three elementarily distinct classes of rock, though the subdivisions are numerous. These principal groups are the traps, amygdaloids and conglomerates. The two former are old lava flows, while conglomerates are composed of broken rock, sand and gravel, cemented by pressure, and were once seabeds. The traps and amygdaloids are in many respects similar, the main difference being in the greater density and uniformity of the traps. The copper is found in a chemically pure, or native state, in the amygdaloids and conglomerates, and occasionally, to a limited extent, in the traps. The theory most commonly held is that the copper was deposited by precipitation in the cavities in the strata from the waters of a sea above. The traps being dense rocks, usually basic, there was little chance for the deposition of copper therein. The amygdaloids contained an infinite variety of granular and crystalline rock forms, the calcareous and silicious portions of which were dissolved quite readily by the waters, presumably powerfully impregnated with salts, and in the apertures left by the dissolution of the chalky and sandy nodules, the copper was deposited when precipitated from the waters above. There is also a theory that the copper is purely of igneous origin.

A cross-section of the formation at any given point would show a large number of trap, amygdaloid and conglomerate strata, lying one upon the other, from south to north. These vary greatly in thickness, but are persistent both as to length and depth. There must necessarily be an end to even the greatest lava-flow, and owing to inequalities existing on the land-surface or sea-bed over which these old flows spread, the stratum may be temporarily cut out, to reappear at greater depth, or to the sides of the point of disappearance.

Geological observation in the Lake district has been founded very largely on the conglomerates as base-lines, and many conglomerate reefs have been identified and traced for considerable distances. This system of geological identification is obviously correct, as the conglomerates differ more radically from the traps and amygdaloids than do the latter from each other. All of the various strata of traps, amygdaloids and conglomerates vary from each other to a greater or less extent, according to their chemical and petrographical formation, crystallization, and alterative influences to which they were subjected after their original deposition. Some of the traps are blue, others greenish in color, with various minerals added to the original diabase, such as augite, prehnite, calcite, and others. In addition to the diabase, there are felsite and porphyritic rocks, richer in silica.

Of the conglomerates, many carry copper in minute quantities, but only two have been mined, these being the Calumet and Allouez conglomerate reefs. Nearly all the amygdaloids carry copper to some extent, but not all have it in sufficient quantity to render mining profitable. With the exception of three mines working on conglomerates and two on veins, all the active

mines of the district, including producers and properties in process of development, are opened on amygdaloid lodes.

In addition to the main portion of the Keweenaw series, which consists principally of eruptive rocks, a second division, mainly of sedimentary rocks, was formed at a later period, and in this second division the Nonesuch mine, in the Porcupine Mountains, was opened and found very rich in fine copper. The second division of the Keweenaw series was formed mainly by the breaking down of the eruptive rocks of the preceding formation, and the redeposition of the detrital rock so secured in the form of conglomerates and sandstones.

The crystalline rocks stand higher than the adjacent strata that had less power of resisting the elements and glacial action. These latter have been much eroded in ages past, in consequence of which the copper-bearing belt forms a ridge rising from 400 to 800 feet above the level of Lake Superior, with the sandstone sloping to the water from either side. In many places, especially at the crests and escarpments of the igneous strata, the naked rock stands out strongly, but the lower portions are covered with drift. In places an overburden of 200 or more feet of sand is found surmounting the rock, and swamps above the ledge of solid rock are of frequent occurrence. These are serious obstacles to the locating of mineral deposits, and also hinder the geological exploration of the district.

The dip of the various strata, copper-bearing and otherwise, varies greatly at different points, ranging from 73° with the horizon at the Baltic, to as flat as 25° at the Arnold. In a general way the dip of the trap series is sharpest when the trap belt, as exposed at surface, is narrowest; and flattest where the trap formation is widest. In a general way it may also be said that the dip of the strata is sharpest nearest the eastern sandstone and flattest nearest the western sandstone, an evidence of a folding or pushing force exerted from the direction of the eastern or Potsdam sandstone. The contact of the eastern sandstone is much tilted from the apparently horizontal position occupied a little further east, the sandstone standing almost vertically at some places where adjoining the eruptive rocks.

In addition to the copper-bearing amygdaloids and conglomerates, there are other sources of copper supply of minor value. The first of these in importance, judging from the amount of copper produced in the past, is found in the fissure veins. These cross the formation at approximately right angles and as a rule are nearly vertical in dip. The copper in these was presumably deposited in the same manner as the crevices in the amygdaloids and traps were filled with the same metal. The second source of copper is in the contact veins, of which the old Minnesota mine affords much the best example. The third source of copper is found in the ores. The Cliff, the first and one of the greatest dividend-payers among Michigan copper mines, was opened originally as a mine of black oxide of copper. The Calumet & Hecla was noted, when first opened in 1866, for the large amount of malachite found in the conglomerate near surface but in this instance the carbonate had been formed by the action of the elements from the native copper, which replaced

it at a little depth. Various fissure veins of copper ore have been found, especially on Keweenaw Point, well toward the eastern end.

The existence of native copper on the southern shore of Lake Superior was first made known to the world by the intrepid Jesuit missionaries of France, who visited the unknown inland sea early in the Seventeenth century. Native copper was found by other explorers in that and the succeeding century, and in 1770 one Captain Jonathan Carver printed a book in London, telling, among other things, of the richness of Lake Superior in copper, which had but to be picked up and carried away. This led to the formation of a copper mining company in London, and a party of miners sent over from England worked on the banks of the Ontonagon river in the winter of 1771-72, under the direction of Alexander Henry, an adventurous Englishman who had turned hunter, trapper and finally miner. A long adit was driven in a clay bank; this caved in when the rains came in the spring, and no further attempts were made at mining copper for seventy years.

In 1830 the southern shore of Lake Superior was first visited by Dr. Douglass Houghton, of Detroit, a young scientist combining with his technical skill rare and valuable courage and practical knowledge of men and matters. Through his indefatigable efforts the upper peninsula of Michigan was first surveyed, and the discoveries of Dr. Houghton led to the exploitation of both the copper and iron measures of the Lake Superior district, now among the most valuable and productive mineral fields of the world. The first "miners" to reach the Lake Superior copper fields were Jim Paull and Nick Miniclear, two backwoodsmen who came overland from southern Wisconsin in midwinter, suffering great hardships, and arrived on the shore of the great lake in March, 1843. The federal government opened a land office at Copper Harbor in the same year, and a number of hardy prospectors began work before navigation was closed by the storms of early fall. More miners, most of whom were devoid of practical knowledge, arrived in the following year, and as the news of important discoveries became bruited about, the first Cornish miners arrived to do real mining. The operations of the first two or three years were productive of little but knowledge, secured by mistakes that now appear ridiculous. The first copper in any quantity of importance was taken from a vein of melaconite in Keweenaw county in 1846; the same company opened a fissure vein of native copper a little later, and begun the payment of dividends in 1849, since which time there have been dividends paid in each successive year by Lake Superior copper mines. But little later than the early operations of the Cliff company in Keweenaw county were the pioneer operations of the Minnesota company, in Ontonagon county, at the other end of the district. Extensive remains of prehistoric mines were found at many points, and a number of the best mines of the district have been developed on lodes revealed by lines of old pits.

In the earlier years of development the profitable mines were opened on fissure veins in Keweenaw county, and on the contact veins of Ontonagon county. The middle, or Portage Lake district, was held to be of little promise, and the attempts made to open paying mines on the stratified beds were

regarded with amused contempt by the successful operators of vein mines, until at last the Quincy mine made a success of an amygdaloid lode. At present all but two of the active mines of the Lake district are opened on stratified beds, and of the two remaining mines, one is equipping a mill to treat copper from fissure veins in Keweenaw county, and the other is reopening the old contact vein of the Minnesota mine in Ontonagon county, in addition to developing a new mine on an amygdaloid bed.

MINNESOTA. The western continuation of the Keweenawan cupriferous formation extends from the upper peninsula of Michigan across northern Wisconsin into Minnesota. The Keweenawan rocks are found in Cook, St. Louis and Pine counties in the northeastern part of the state and short-lived attempts at prospecting have been done in all three counties. Native copper and malachite have been found in Chisago county. An occurrence of copper of geological interest, though of no commercial importance, was noted in St. Louis county in 1900, when the Montana shaft of the Minnesota Iron Company yielded about 100 pounds of native copper, found in sheet form imbedded in iron ore, at a depth of about 300 feet.

MISSOURI. Carbonate and sulphide ores occur at a variety of points in this state, and a number of small mines have been opened, though none are now working. Native copper and various ores are found in the Stanton mine in Franklin county. Malachite, azurite and chalcopyrite occur in the Circle Diggings of Cole county, and at the Collins mine in Cooper county. Malachite has been found in the Cherry Valley mines of Crawford county. A little chalcopyrite is found at times with the sphalerite in the zinc mines of the Joplin district, in Jasper county. The O'Bannon and Buckeye mines at Fredericktown, Madison county, were once worked for copper, and while in the Catherine lead mines, near Fredericktown, in October, 1902, I secured a little chalcopyrite from magnesian limestone carrying disseminated galena. Chalcopyrite has been found in Jefferson county, and Shannon county had a short-lived copper boom in 1901.

The Cornwall and Swansea copper mines were opened in 1863 on parallel blanket veins of disseminated chalcopyrite with chert gangue in a country rock of silurian limestone. The southern half of the state, from the Mississippi river to the Kansas line, possesses great mineral wealth, and while the principal developments will probably be in lead, zinc and iron, the opening of a profitable copper mine is by no means impossible, as the southern Missouri formation of magnesian limestone of carboniferous age, intruded by granite and porphyry, is one that has given to the world some of its best copper mines in other fields.

MONTANA. The Butte camp of Silver Bow county is now, and for several years has been the largest producer of copper of any district in the world. Copper ore is found in the counties of Beaverhead, Cascade, Deer Lodge, Granite, Jefferson, Madison, Meagher, Lewis & Clarke, Park, Silver Bow and Teton. A little mining is done outside of Silver Bow county, and in these dis-

tricts the ores are mainly sulphides, usually in association with diorites appearing as intrusives in a quartzite country rock of Cambrian age.

The Butte camp is approximately a rectangle of four by seven miles; but the more important mines and principal production are in an area of little more than two square miles. From this little spot has come hundreds of millions of dollars worth of copper, silver and gold, and under normal circumstances the production of this district, small only in area, is not less than 10,000 tons of refined copper monthly—an amount fifty per cent greater than the output of any other cupriferous district of the world.

Butte was originally a placer gold camp, but as such was of small importance and short life. Silver mines were opened later, and these turned into copper mines at depth. As early as 1880 the Parrot and Boston & Colorado mines were making argentiferous matte, and in the following year was begun the great development that transformed Butte into the world's greatest copper camp within a decade.

The country rock of the Butte district is granite, of which the Butte granite is the elder and the Bluebird an intrusive. The ore bodies are of very irregular form, occurring in veins ranging from mere seams up to 100 feet in width, with many bulgings and pinchings from point to point, but with a general tendency toward greater width at depth. The veins are considerably faulted and cut by horses of dykerock. The walls are poorly defined in many cases, and this gives rise to the plausible theory that the veins have been formed along a series of small fissures marking a line of disturbance, rather than from a general faulting, and that these small fissures have been greatly enlarged at many points by replacement of the original walls. The veins are nearly all mineralized and form a veritable network underground, crossing, interweaving, pinching, enlarging and behaving generally in the most erratic manner. The damnable mining laws of the United States are peculiarly adapted to the fomentation of mining litigation, and as a consequence of the physical and scientific impossibility of determining the apices of many of the veins, the principal mining interests of this district have become entangled in a maze of lawsuits that cannot be settled during the lifetime of the present generation, unless the litigants can arrive at some understanding out of court, or the weaker parties be driven to the wall. That the mines work and earn good profits after paying the millions spent in litigation is strong evidence of the richness of the district. In a camp like Butte, every mining claim should carry its title to the side-walls, and not an inch beyond. Any other system, and most especially such a cumbersome and dishonest system as furnished by the present federal mining laws, is an incentive to rascality, a discouragement to legitimate mining, and a disgrace to the country responsible for laws so utterly at variance with common sense and common honesty.

The gangue of most of the ore bodies is granitic or silicious. A little native copper is found in the granite at points. In the case of most mines of the district the upper levels carry high values in silver with only a trivial amount of copper, the latter averaging one per cent. or less. This oxidized zone

has a depth of 200 to 400 feet as a rule. Below this there is a median zone, frequently characterized by veins almost or quite barren of either copper or silver values in the upper section, followed by the richer sulphides. This middle zone varies greatly in characteristics in different shafts. The third or lowest zone is found at about the water level, where the ore becomes unaltered iron sulphides. Unfortunately for the peace of mind of geologists and mineralogists, the Never Sweat mine is now producing the extremely rich ore chalcocite from its 2,200 foot level. This occurrence does not fit in with any of the generally accepted theories of copper deposition, which is bad for the theories. Below the permanent water level the ore bodies, while retaining full width and strength, give constantly decreasing copper values with added depth. The deepest shaft in the Butte district is now down nearly a half mile, and, excepting the chalcocite in the Never Sweat, the percentage of copper decreases in a fairly steady ratio as depth is gained. The Anaconda, which started with 55 per cent ore, is now averaging but a little over 3 per cent copper. There are still lower grade deposits of immense area in the district, as at the Modoc mine of the Anaconda and elsewhere, and in view of the great improvements in metallurgical processes made during the past decade, such ores may be used eventually. While Butte is most distinctly working into a lower grade camp each year, it must not be inferred that the high grade ores are exhausted. All of the big mines have considerable reserves of rich ore, other high grade ores are locked up by litigation, and still others are being developed every year.

Mining developments of the past two years in the flat east of the city indicate that the productive area of the district will be greatly increased, and possibly doubled, in the future. While Butte is no longer the high grade camp of ten years ago, and at least one of its great mines has probably passed its zenith, the district is by no means decadent. It is not likely that any man now living will survive to see the last ton of copper made by Butte mines, nor even live long enough to draw the last dividend paid by a Butte copper mine.

NEVADA. The development of silver mines of fabulous richness, coupled with political exigencies, brought Nevada into statehood, some forty years ago. Beyond working the silver bonanzas along the extreme western edge of the state, there was little mining development attempted, though prospectors brought in reports of rich discoveries from every county. Lack of railroad lines, coupled with a sparse population and mountainous topography, discouraged exploration, and for these, and possibly other reasons, Nevada has received less attention from the miner than any other of the western mining states. Of late this old order of things seems to be changing, and better times are in store.

Copper ore is reported from the counties of Elko, Esmerelda, Eureka, Humboldt, Lander, Lincoln, Nye, Storey and White Pine. Mines are now being developed, and while operations are upon a rather small scale at most of them, promising properties are being opened in several cases. The state is still most inadequately supplied with railroads, wagon-roads and people, and

these drawbacks will deter the development of copper mines until partially overcome, but it is probable that the future will see an increasing interest in the mining of copper, as well as of gold and other metals, especially as Nevada lies between California and Utah, two of the richest mineral states of the Union, and the general geological conditions are much the same in these states and Arizona as in Nevada.

NEW HAMPSHIRE. Copper ores are noted at a number of points in this state, more especially in Grafton county. There are also deposits of apparently considerable extent in the Mt. Gardner district, near Woodsville, and chalcopryite has been found at other points, including Franconia in the White Mountains, where the ore occurs in gneiss.

NEW JERSEY. The first copper mine in the United States was opened in New Jersey, and this, the old Schuyler mine, discovered in 1719, is now being worked by the Arlington Copper Company. The Schuyler was worked upon what was considered a large scale in those days, and made its owner wealthy. Work was suspended when the Revolutionary War begun, and the mine has never been steadily worked since that time, although it has been operated spasmodically on several occasions.

Ore deposits of low grade are found at a number of points in this state, and there is considerable native copper in the vicinity of Somerville, Flemington and New Brunswick. There are also old copper mines at Belleville, Griggstown and New Brunswick, most of which were small and unsuccessful. As the known deposits of ore and native copper in this state are of low grade, it is obvious that success can be secured only by the operation of mines upon a fairly large scale.

NEW MEXICO. Native copper has been found in the Santa Rita mines of Grant county, and copper ores are found at many points in the state, having been noted in considerable quantities in the counties of Grant, Lincoln, Rio Arriba, Santa Fe, Sierra, Socorro and Taos. General geological conditions are favorable to the finding of profitable mines, and there are several properties of considerable magnitude and good promise, notably the Aberdeen, at Lordsburg, which is a dividend-payer, the Santa Fe, Santa Rita and others. There is much prospecting for copper in progress, and a number of mines are being opened in the various counties. New Mexico has had a rather poor standing among mining men for the past fifteen or twenty years, due to some large failures scored in the territory in early copper mining ventures, but these seem to have been the fault of general conditions rather than to have come from the lack of ore. The first mining ventures were carried on under great disadvantages, and it is unfair to the territory as a whole to condemn it because of the failures of a few mines. There are many more failures than successes, even in the best copper mining districts of any state or country, and in the neighborhood of the greatest successes will nearly always be found the biggest failures.

NEW YORK. The Empire State has no copper mines, although copper ores have been found at a number of points. Chalcopyrite is found at the Ancram and Beckee lead mines in Columbia county; at Ellenville and the Red Bridge lead mines in Ulster county; with arsenopyrite near Wurtsboro, Sullivan county; in Chester, Warren county; Eastchester, Westchester county; Crown Point, Essex county; Alexandria and Antwerp, Jefferson county; Salisbury, Herkimer county, and at Canton, Fowler and the Rossie iron mines in St. Lawrence county. Malachite and cuprite occur at Ladentown, Rockland county, occurring in thin seams in the trap, and azurite, malachite and chalcopyrite have been found near Ossining, Westchester county.

NORTH CAROLINA. This is an important state, rich in mineral resources, and although it has never been a considerable producer of copper, may become such in the future, as its ore measures are of large extent and decidedly promising at some points. The state had several small copper mines in regular operation before the Civil War, and has been a regular though small producer of the metal for some years past. In view of the present interest in copper mining in this state it seems probable that the production will be increased by the making of several mines of fair size.

So far as can be determined by the limited geological research given many of the counties, and the developments to date, the most important copper measures of the state are contained in the counties of Ashe, Rowan, Person, Cabarrus and Granville, but copper ores are also found in the counties of Alexander, Alleghany, Caldwell, Catawba, Chatham, Clay, Davidson, Gaston, Guilford, Jackson, Lincoln, Madison, Mecklenburg, Mitchell, Montgomery, Moore, Rockingham, Swain, Transylvania, Watauga, Wilkes and Yadkin, and very possibly in several others as well. The ores are mainly sulphides, considerable chalcocite being found in Ashe and adjoining counties, but native copper has been found at the McCulloch mine in Guilford county, and all of the commercial ores of copper are found in the state, as well as a long list of the minor ores. The variety of copper minerals noted in North Carolina is probably nearly or quite as great as in Arizona.

The Virgilina district, on the border of Virginia and North Carolina, and including the counties of Person and Granville in the latter-named state, has sulphide ores occurring in lenses longitudinally, and apparently in series vertically, as proven by developments to about 300 feet in depth. The Virgilina district is in the sub-Piedmont division of the Appalachian belt, and in the same division, considerably further south, is found the Gold Hill district, where there has been considerable development, and where the ores apparently hold their full values to the greatest depth reached, which is slightly under 1,000 feet, the ore running 1 to 10 per cent copper, 2 to 4 ounces silver and about \$2 per ton in gold. The area of the Gold Hill field, as far as determined, is about 25 miles in length by one mile in width. The chalcopyrite occurs in quartz and a decomposed schist.

OHIO. Native copper nuggets brought down from Lake Superior by glacial action are frequently found in the drift in this state, and native copper

nuggets and ornaments are taken from the mounds built by a prehistoric race, but such occurrences are not of industrial value, and are of but slight geological interest. So far as reported, no trace is found of any copper deposits in place in the state.

OKLAHOMA. Copper ore has been found in small quantities at several points in this territory, but so far as known none of the discoveries are of much promise. A little excitement was caused late in 1901 by the finding of copper ores in the hills of Wood and Woodward counties, but nothing came of the discoveries.

OREGON. Copper ores are found in a number of districts in this state, notably in the counties of Baker, Grant and Josephine. The St. Helens district is regarded as of promise. In Josephine county, just north of the California line, the copper belt of that state continues into Oregon, general conditions being similar to those in Del Norte county, California. The Dietrick district in Josephine county is the scene of some little activity in copper development at present. The ore in this district carries good values in gold and silver, as well as high percentages of copper, and the veins are said to be of good width. The Burkemont district is in eastern Oregon, and is apparently a continuation of the Seven Devils district of western Idaho, which it adjoins. There are considerable bodies of low-grade ore in this district, and it is evident that profitable mines can be made only by large development and the steady production of a large ore tonnage.

PENNSYLVANIA. Although copper mining was undertaken in Pennsylvania more than a hundred years ago, the state yet lacks a copper mine. The earliest attempt in this line was at the Gap mine, in Lancaster county, which was opened as a copper mine in the eighteenth century, and was a failure as such, but was reopened as a nickel mine about 1850, and was successfully operated for that metal, with a small incidental production of copper, until 1893, when the richer mines of the Sudbury district of Ontario brought about a fall in the price of nickel that closed the Gap. There are copper ores at a number of points, mostly in small quantities. Native copper, chalcopyrite, azurite, malachite, chrysocolla, cuprite and brochantite are found at Cornwall, Lebanon county. The Perkiomen mine in Montgomery shows as long a list of copper minerals. In an abandoned lead mine at Schuylkill, Chester county, a variety of ores and native copper occur, and chalcopyrite is found in the Elizabeth mine at Norwich, in the same county. Native copper and cuprite have been found near Gettysburg. Native copper, malachite, chrysocolla, chalcopyrite, cuprite, melaconite and aurichalcite occur at Jones's mine, Morgantown, Bucks county, and malachite has been found at New Britain in the same county. Oxide, carbonate, sulphide and silicate ores have been found in small quantities in the quarries of Frankford, a suburb of Philadelphia. Bornite has been found in York county, and sundry ores are reported from Montgomery county. A little prospecting for copper has been done during 1902 in Pottstown and also at Tunkhannock.

RHODE ISLAND. There are no mines of copper in this little state, but chalcopyrite ore is found at Portsmouth, and malachite, azurite, bornite and chalcopyrite occur at Cumberland, while malachite, azurite and chalcopyrite have been found at Johnston.

SOUTH CAROLINA. Chalcopyrite has been found in the Fair Forest gold mines, in Union county, but, so far as known, there are no copper deposits giving promise of making mines within the limits of the state.

SOUTH DAKOTA. In the southwest corner of the state of South Dakota, arising from an extensive plain and isolated geologically, is the peculiar mountainous region known as the Black Hills. These mountains are a veritable storehouse of nature's mineral wealth, and there are but few metals not found here in greater or less profusion. The presence of copper was noted by early explorers, but in the all-consuming search for gold the other metals were neglected until a few years ago. Copper ores are in demand at the local smelters for use as fluxes in reducing refractory gold ores, being preferable to the barren fluxes that would otherwise be necessary. Geologically, the copper measures of the Black Hills have been compared by several scientific observers with those of the Ducktown district of Tennessee. The principal mining developments have been made in Pennington county, where several copper mines are now being developed.

TENNESSEE. The proven copper deposits of Tennessee occur in Polk county, in the extreme southeastern corner of the state, although the discovery of high-grade copper ore was reported from Lawrence county late in 1902. A little native copper is found in the Ducktown mines, but the important source of supply is chalcopyrite. The Ducktown district was discovered circa 1840, and as early as 1854 there were two blast furnaces in operation at that point. A thriving industry had been built up and the prosperity of the district seemed assured when the Civil War brought mining and smelting to a standstill, and work was not resumed until some years after the war, and then in a small way only. A British syndicate did the first post-bellum work, and has been followed by a strong American company. The copper industry of the Ducktown district seems to be on an assured footing again, with every prospect of growth in the future.

TEXAS. A little native copper is found in Burnet and Llano counties, and there are ores of chalcopyrite in both counties, as well as argentiferous tetrahedrite in the latter. Carbonate and silicate ores are exposed at a number of points along the Brazos river, in the Permian sandstones. Malachite and azurite, also chalcopyrite and bornite, in a quartz gangue, have been found in a prospecting shaft four miles north of Llano, the ores carrying 0.11 ounces of gold and 2.5 ounces silver per ton. A hand-picked sample of tetrahedrite from Babyhead Mountain, Llano county, gave 107.8 ounces silver and 6.4% copper. The White Eagle Copper Company, operating in Burnet county, has developed a mine by shaft and an open cut. It is prob-

able that copper ores will also be found in several other counties of the Texas mineral zone.

UTAH. Copper has long been produced from Utah mines, but until quite recently the metal has been obtained only as a by-product from the smelting of gold and silver ores. With the development of the Utah and Bingham mines of the West Mountain district of Salt Lake county, a new era has been entered upon, and Utah's copper output is increasing rapidly. The principal producers are in Salt Lake county, but there are very promising properties in process of development in Beaver county, and there are also copper ores and occasional exploitations in the counties of Juab, Piute, Summit and Tooele.

The mines of the West Mountain district are of exceptional promise, and are already considerable producers. All of them carry gold and silver in sufficient quantities to materially reduce the cost of copper production, and greater attention is being paid to copper-bearing veins in the older mines, some of which are proving valuable. Some of the properties in Beaver county are among the most promising to be found anywhere, at a similar stage of development. Utah has long been one of the solid mining states of the Union, and its mines, largely developed and owned by local capital, until within the past few years, have an enviable record of dividends. Some of the newer copper mines of Utah are in a position to make copper so cheaply, owing to the gold and silver secured as by-products, that Utah must be included in any possible list of the important copper-producing districts of the world.

VERMONT. There are deposits of chalcopyrite at South Strafford, Vershire, Waterbury, Shrewsbury, Berkshire and Corinth in this state, and copper mines have been operated in the past in three districts, at Vershire, South Strafford and Berkshire. The Ely mine had a smelter at Vershire circa 1861-1870, and worked with more or less regularity, but was forced to go out of business by the greatly decreased price of copper following the Civil War. The Elizabeth mine at South Strafford and the Ely mine at Vershire are now in the hands of George Westinghouse, of Pittsburg, and a limited production was effected in 1901-1902 from the Elizabeth, where about one hundred men were worked, while the Ely is being reopened and put in readiness for production. The other mines are idle. The Vermont ore is chiefly chalcopyrite, ranging from 3% to 30% copper, with an average of probably 5% to 10%.

VIRGINIA. Virginia has an auriferous-cupriferous mineral belt, stretching from the Piedmont district in Orange county to the North Carolina line. Copper ore has been noted in the counties of Buckingham, Carroll, Grayson, Fauquier, Fluvanna, Franklin, Greene, Halifax, Loudoun, Louisa, Montgomery, Nelson, Orange, and Polk. There are copper mines of small extent in Fauquier and possibly in other counties of the state, but the largest mines and principal development are found in Halifax county. The Virginia district lies in both Virginia and North Carolina, the Virginia portion

being in the county of Halifax. This district, as developed, is about twenty miles long by three miles wide, with indications of copper beyond these boundaries. The ores are chalcocite and bornite in a quartz gangue, and average possibly no more than 3%, though having frequent chutes running 20% to 30% copper. The ores of this district, as mined, average about one dollar gold and six to ten ounces silver per ton, and, with their gangue, run from 4 to 10 feet in width. There are fourteen mines in this district, of which four are producers, with the others developing or idle. The advantages enjoyed by the mines of the Virgilina district are cheap fuel and labor, an equable climate and proximity to the Atlantic seaboard, with which there is good rail communication. Several strong companies are now operating in this field, and it is likely to be heard from in the future as a considerable producer, the gold and silver values being sufficient to permit the operation of low-grade and narrow ore bodies that would otherwise offer little promise of adequate returns.

WASHINGTON. There are copper deposits in King, Stevens and other counties of this state, and a little attention is being paid to copper mining at present. None of the mines have yet advanced to a stage where it is possible to predict a certain future, but some promising prospects are under development.

WISCONSIN. There are copper ores in the zinc and lead district of southwestern Wisconsin in the vicinity of Shullsburg and Mineral Point, and some crude attempts at mining copper have been made at the latter-named town. Chalcopyrite and malachite have been found in Sauk county, and in 1902 a diamond drill boring north of Osceola gave cores assaying well in copper and with small values in gold and silver.

The northern fold of the Keweenaw trap formation extends across the Lake Superior shore of northern Wisconsin from Bayfield to the Minnesota line, carrying more or less native copper in the mineralized amygdaloids. This formation is described in the article on Michigan. A number of small shafts have been sunk on this fold of the Keweenaw formation, in Douglas county, but no mines have resulted from the work. The most extensive work was done at the Chippewa property, which came to grief financially late in 1902. A recent development, which is apparently much the most important ever made in the state, is noted in the southern end of Douglas county, where the Minong Range Copper Company is sinking two shafts in an amygdaloid. The importance of this work lies in the fact that the formation dips northward at this point, showing that the shafts are on the southern fold of the synclinal, this being the fold on which all the profitable mines of Lake Superior native copper have been opened, all mines on the northern fold having proved failures. Considerable heavy copper has been secured in one of these shafts, and the outcome will be awaited with interest, as the making of a paying mine at this point would treble the area of the possibly profitable zone of the Lake Superior copper field.

WYOMING. Although Wyoming is one of the newest copper fields of the United States it is by no means least in promise, and the Grand Encampment district has attracted wide attention, as well as the investment of large amounts of money. I am indebted mainly to Prof. Henry C. Beeler, state geologist, for the facts in the following summary of Wyoming copper deposits and prospects.

The principal cupriferous field of the state is the Grand Encampment district, having an estimated area of 2,500 miles, and lying in the southern half of Carbon county and the southwestern quarter of Albany county. The district is divided in two nearly equal parts by the North Platte river, and has the Sierra Madre Mountains to the west and the Medicine Bow range on the east. Encampment is the principal town of the district. While there were known to be promising mineral indications, little was accomplished until 1898, when gold prospecting begun. This was not especially successful, but copper prospects were located soon thereafter, and there has been increasing interest since then in copper development.

The general formation of the Sierra Madre is an irregular core of red granite, with fine-grained mica-hornblende schists of Algonkian age lying thereupon. Both schists and granite are cut at intervals by dykes of diorite and associated dyke rocks, the dykes running in apparent conformity with the strike and dip of the schists when traversing them. Associated with the schists and conformable in strike and dip are huge ledges of quartzite and altered schists known locally as lime dykes, the alterative material having been mainly lime, with some silica. Extensive evidences of replacement and alteration are frequently noted in the granite and diorite, as well as in the schists.

While the formations in general are fairly mineralized the principal ore bodies are found in the contacts between the schists and adjacent rocks, especially so in the contacts of schists and quartzite. The outcrops are usually of soft spongy limonite carrying some hematite, and often show a little quartz in the ore. These outcrops are noted on veins ranging from mere stringers to a width of 20 feet or more, and extend to water level, a depth of 35 to 100 feet. The iron oxides are usually associated with copper carbonates, the percentage of copper being small at surface and increasing with depth. A little chalcocite is found in the zone of secondary enrichment, but at or about the water level the ores change to chalcopyrite and bornite. Above the water level the altered ores are mainly malachite and azurite, with a little native copper. In several instances the outcrops are fairly pure specular or silicious hematite, associated with white quartz. In the cases where copper sulphides outcrop the same white quartz is found in association.

The district has been a producer since 1900, ores shipped assaying 30% to 49% in carload lots. This necessitated hand-selection and the rejection of the lower-grade ores. The high-grade ores carry \$8 to \$10 per ton in gold and silver. The district has a smelter which handles mainly low-grade ores, the product therefrom being shipped as high-grade matte. An interesting feature of this district is an aerial tram 16 miles long, in four

sections, running from the Ferris-Haggerty mine to the Encampment smelter, this being in successful operation.

The Medicine Bow range on the eastern side of the Encampment district has been prospected for years, mostly for gold, of which little has been found. In 1900 the Great Rambler mine, opened and abandoned as a gold property, was relocated for copper, and begun shipping ore at once. An interesting feature of this property is the finding of platinum in commercial quantities. The general formation of the Medicine Bow range is a gray and red granite, flanked more or less irregularly by schists and gneisses, with dykes similar to the Encampment district as before described. The Rambler is evidently opened in fissures in the black, dioritic granite, but its upper workings show alteration conditions similar to those prevailing to the westward.

Among the other copper districts of the state is the Laramie Hills, running along the southern state line from Laramie through Albany and Converse counties to Caspar, Natrona county. The formation is a granite core with north and south trend, flanked by schists and succeeding sedimentary formations. Copper is found native in red disintegrated granite at Sherman Hill, and as sulphide ores in prospects at Hecla, Slate Creek, Cooney Hill and to the northward of Laramie Peak. Copper ores have also been found in the Big Horn Mountains and in the Wind river districts, under conditions resembling those of the Grand Encampment district, though little development has yet been attempted on any discoveries in the two last-named districts.

The copper properties of the Encampment district are obviously of more than average promise, the richness of their ores and the considerable values carried in the precious metals enabling owners to develop properties from shipments secured near surface. The alteration zone is of shallow depth, however, and the ultimate value of the district must be determined by the values secured from the unaltered sulphides, on which little work has yet been done. The oxidized ores, however, will enable many owners to give their mines thorough tests at small cost.

CHAPTER VIII.

COPPER DEPOSITS OF CANADA AND NEWFOUNDLAND.

In this chapter the copper deposits of Canada are treated in detail, by provinces, and for geographical convenience, Newfoundland is added, although Newfoundland has never become a part of the Dominion of Canada.

While the metal has been mined for many years in the eastern provinces of the dominion, the Canadian copper industry was never of importance previous to the exploitation of the great nickel-copper deposits of the Sudbury district, in the middle eighties. Since that time the British Columbian fields have become prominent as producers, and the copper industry of Canada is apparently but in its infancy. The dominion must be included in any list of the principal copper producing countries of the future.

NOVA SCOTIA. Native copper is found in this province in the counties of Annapolis, Cumberland, Digby and elsewhere, while copper ores are noted in the county of Anitgonish, near Sidney, and at New Annan, Cape Breton, Colchester, Cumberland, Pictou and Sidney. The ores are mainly sulphides, and at Briar Island, Digby county, the native copper is found in grains in amygdaloidal trap, under circumstances similar to the occurrence of the native metal in the Lake Superior copper district. The Cape Breton deposits are of chalcopyrite, and carry both gold and silver, the ore having a silicious gangue and traversing diorite and felsite rocks.

Present developments in Nova Scotia are mainly in Cumberland and Cape Breton counties. The old Coxheath mines at Coxheath, Cape Breton county, are being operated, while other mines are being developed at Cape d'Or and Wentworth, in Cumberland county.

NEW BRUNSWICK. Copper ores are found in this province in the counties of Carleton, Charlotte, Gloucester and St. John, and native copper is found in certain of the older sandstones. There has been a renewal of interest in the copper deposits of New Brunswick within the past five years, and mines are now being developed at several points. While no striking successes have been scored as yet, there are several properties with good prospects, and it is hoped that some good mines may result from the work now being done.

QUEBEC. In this province copper ores have been found in the counties of Arthabaska, Bagot, Beauce, Brome, Dorchester, Drummond, Levis, Lotbiniere, Megantic, Missisquoi, Richmond, Sherbrooke, Shefford and Wolfe, and also on the north shore of the Gulf of St. Lawrence in the district of Saguenay. Mines have been opened at various times and points in several

of these counties, but the principal development has been at Capelton, in the little county of Sherbrooke, just above the New England border. The ores, like those of Ontario, are mostly chalcopyrite, and invariably so where found in quantities sufficient to justify the opening of mines. The sulphide ores of copper are frequently found in conjunction with pyrite and pyrrhotite, and are sometimes developed in mines first opened for pyrite destined for the manufacture of acids. The principal mines have been opened in limestone, near the point of contact with serpentine and diorite rocks, the limestones being more or less closely associated with slates. The Capelton mines carry 3 to 4 per cent. copper and 3 to 4 ounces of silver per ton. The sulphur from these mines is saved, as far as possible, for the making of acid.

ONTARIO. There are copper ores in this province at many different points, and at some of them large mines are opened, while in others mines are developing, and in still others mining work is confined to the merest prospecting. Ontario is a large province, and has a great diversity of topography and geological conditions, its frontier marching with New York in the east and Minnesota on the west.

Copper is found native at several points, but mainly as sulphide ores, and in the Sudbury district the iron-sulphide ores of copper are highly nickeliferous, so much so that this district furnishes more than half of the nickel supply of the world. As a rule the oxide and carbonate ores of the alteration zone are missing in Ontario, the unaltered iron sulphides, mainly chalcopyrite, with a little bornite, reaching to surface with slight traces of change.

The first copper mining in the province was undertaken at the Bruce mines, on the northern shore of Georgian Bay, in 1846, immediately after the opening of the first Lake Superior native copper mines of Michigan. After many years of idleness these mines are now being reopened. The first really important production of the metal after the suspension of work at Bruce Mines came from the discovery of the nickel-copper ores of Sudbury, in 1883, and their development. The ores of the Sudbury district are nickel-copper-iron sulphides, occurring in a country rock of diorite. Mines have been opened at various points in a district several miles square, in the vicinity of Sudbury and Copper Cliff. This district is a fairly large and increasing producer of copper, but, like all other good districts, has its wild-cats and failures, as well as its bonanzas.

Copper is also found in Lanark county, and in the Nipissing district. In the Parry Sound district there are numerous occurrences of the ore, the mineralized belt being of considerable area. This district is located along Parry Sound, on the east-central part of Georgian Bay. The geology of the district is as yet unsettled by the scientists, considerable differences of opinion existing among the various observers. The prevailing rock-forms of the district are gneisses and schists, and the formation shows marked flexion and faulting. There are numerous small quartz veins and frequent pegmatite dykes of large size and great persistence. The topography is rough and much of the rock is utterly devoid of vegetation or covering of

any sort, the bald knobs alternating with marshes and swales in the lower ground. The mineralized zone is apparently about a quarter-mile in width with a generally northeasterly and southwesterly trend, and has been prospected for about twelve miles. The ore occurs as extended and approximately parallel lenses with a general trend in line with the mineral belt, and the ore bodies are frequently capped with gossan. The ore, as a rule, is chalcopyrite, with a little bornite and occasional chalcocite, and is auriferous, gold values running \$3 to \$10 per ton in many cases. Some of the beds are nickeliferous also, the nickel running as high as 2.5 per cent. in some instances.

The district of Algoma, which is very extensive, has copper deposits at a number of points, of which the principal, judged by past development, is in the Bruce Mines district of Georgian Bay. This field also includes the Rock Lake district, sixteen miles distant, where one large mine has been opened and a number of smaller properties are developing. The ores are chalcopyrite in a gangue of quartz, apparently in true fissure veins giving every evidence of permanency. In the Goulais Bay district, north of Sault Ste. Marie, several promising prospects are in process of development. On the northern mainland of Lake Superior, to the eastward of Michipicoten Island, there are sulphide ores of which little is known, beyond the fact of their existence. On the island itself there are amygdaloid strata carrying native copper, this being the easternmost outlier of the Keweenawan formation of the western half of Lake Superior. Various attempts at opening mines on these beds of native copper have proven unsuccessful. Chalcopyrite, chalcocite and domeykite have also been found on this island, in small quantities.

On the northern shore of Lake Superior, east of Thunder Bay, native copper is found on Battle Island and St. Ignace Island in Nepigon Bay, and at Pointe-aux-Mines. Chalcocite occurs on Spar Island, and chalcocite and malachite are found on Silver Islet. In the Thunder Bay district chalcopyrite occurs at Neebing, and a little development has been made at Black Bay and Shebandowan Lake, on native copper in trappean rocks.

In the Rainy River district sulphide ores have been found at several points.

MANITOBA. The province of Manitoba is an agricultural rather than a mining district, but there is a small area of mineral land along the eastern boundary, near Lake of the Woods. A vein, running 18 to 20 inches wide, occurring as a contact between granite and trap, and traceable for a half-mile, has been slightly prospected at Ingolf station, very near the Ontario boundary. This is a pyrrhotite carrying copper, nickel and traces of gold.

BRITISH COLUMBIA. This Canadian province is a kingdom in both area and resources. Its wealth of timber and mineral has been merely scratched, and the development of the past decade, while very great, both actually and relatively, is but the precursor of a far greater work to be accomplished in the future.

The first mining was on placers, for gold, nearly half a century ago. When the placers were exhausted the mining industry languished until the completion of the Canadian Pacific railroad through to the west coast, when permanent mining began in a small way. The first mines were of gold and silver, lead becoming an important product a little later. When the mines of the Trail creek and Boundary districts were opened, less than ten years ago, it was soon found that many of the mines carried considerable copper values. The bulk of the copper production of British Columbia is secured as a by-product from mines of gold, silver and lead, but several exclusively copper mines have been developed. A peculiarity of British Columbian mines—and by no means a disadvantageous one—is that the gold and silver mines usually carry more or less lead and copper, while the copper mines have appreciable values in gold and silver.

There is more or less copper in practically every mining district into which the province is divided, but the mines of the Boundary, Trail and Coast divisions lead in output. The relative importance of the various districts as producers is shown by the following official table of production of refined copper in 1901.

Districts.	Production in Pounds.
Boundary	14,511,787
Trail (Rossland)	8,333,446
Coast	3,115,872
Nelson	1,599,449
All others	43,192

From the trivial output from the districts lumped together under the caption "all others," it must not be inferred that they are of no importance. Many mines of good promise are found in these districts, but lack of development and adequate transportation lines is responsible for small production.

British Columbia now has a number of smelters, all new and mostly large and modern. Excellent results are being secured at many of these, and Wm. Fleet Robertson, provincial mineralogist, estimates that the cost of smelting copper has been reduced as low as \$1.35 to \$1.50 per ton of ore. These figures are astounding, and coming from a less eminent and accurate source would be received with suspicion.

NEWFOUNDLAND. There are sulphide ores of copper at many points in this island, and native copper has been found in place in stratified archaic rocks, under conditions resembling those governing in the Lake Superior district, on Odorin Island in Placentia Bay, and elsewhere. One mass of native metal weighing 55 pounds has been found, and the geological horizon of the district in which these occurrences of the native metal are noted is apparently about the same as that of the Keweenaw district of Michigan.

The first mining in Newfoundland was done in 1862, at the Tilt Cove mine, which was reopened in 1887 by the Cape Copper Co., its present owner. There are also other copper mines on the island that have been worked to some little extent, among these being the Little Bay, which has reached a depth of 1,350 feet, the Lady Pond, Betts Cove, York Harbour and others.

CHAPTER IX.

COPPER DEPOSITS OF MEXICO, CENTRAL AMERICA AND
THE ANTILLES.

Under the heading of this chapter are grouped the Latin countries and islands of North America. With the exception of Mexico, which is a copper field of the first magnitude, and with the possible exception of Cuba, where there was once a considerable industry in the mining and smelting of copper ores, the developments noted in this chapter are of comparatively little importance.

MEXICO. The Republic of Mexico has made relatively greater strides in copper production during the past five years than any other country in the world. Not only has there been a most remarkable relative gain, but the actual gain in output puts Mexico an exceedingly close second to the United States in point of increase. That Mexico will soon lead Spain, and rank second only to the United States, seems assured. The Boleo has long been an important mine, but the copper production of all other Mexican mines was but 1,200 tons so recently as 1896. Since that time the Greene, Inguaran, Candela, Moctezuma, and other great properties have been developed. Those interested in copper will do well to keep an eye on Mexico for the next few years.

Copper in almost every known form is found in some part of the republic. The ore measures are extensive and include many different types of deposits. Argentiferous copper ores are frequently found in the crystalline slates of the Azoic group, a typical example being the district south of Puebla. Copper accompanied by hematite is noted in cretaceous beds of the Mesozoic, while in the Cenozoic group copper is found in regular veins in hornblende andesites of the Pliocene system, also in the stratified beds of sedimentary rocks of the upper Miocene and lower Pliocene, the Boleo mine in Lower California being an example.

According to the official figures furnished by the Minister de Fomento, the number of copper mines and cupriferous mines within the boundaries of the republic was as follows on July 30, 1899: Mines of copper only, 221, with an area of 2,184 hectares; of copper and lead, 5 mines, with an area of 31 hectares; copper and gold, 69 mines with 857 hectares; copper and iron, 23 mines with 159 hectares; copper and silver, 192 with 1,637 hectares; copper, silver and gold, 55, with 896 hectares; copper, silver and lead, 12, with 147 hectares. This gives a total of 577 cupriferous mines, and an area of 5,911 hectares, out of a total of 8,970 mines of all classes having an

area of 84,557 hectares in the entire republic. Taking into consideration the marvelous development of the three and a half years that have elapsed since the date of these statistics, it seems probable that the number of cupriferous mines in the republic is materially larger, unless the process of consolidation has absorbed more old mines than would offset the new openings. According to the summary of S. Chapman, F. S. S., made from the Mexican government's Boletín de Estadística Fiscal—date not given—the number of cupriferous mines in the republic is materially greater than the figure first quoted. Chapman's summary gives a total of no less than 839 copper mines of all classes, of which 281 are mines of copper only, the balance producing other minerals as well as copper.

Nearly every state and territory of the republic has copper mines, the roster including the states of Aguascalientes, Chiapas, Chihuahua, Coahuila, Colima, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacan, Morelos, Nueva Leon, Oaxaca, Puebla, Queretaro, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, Vera Cruz and Zacatecas, also the territories of Tepic and Baja California, and the Federal District of Mexico. In point of output Sonora easily leads at present, with Lower California a good second. The more important developments in the other states are in Chihuahua, Michoacan, Durango, Coahuila, Guerrero and Zacatecas, though there is considerable activity in many of the other states, capital having been poured into Mexican copper mines by the tens of millions of dollars during the past five years. Under the strong but equable administration of President Diaz, Mexico has undergone a transformation during the past two decades. There are as ample safeguards for life and property as may be found in any part of Europe or the United States. The laws are administered constitutionally, rather than dictatorially, and the president has surrounded himself by statesmen of ability and honesty, under whose fostering care Mexico has become one of the favorite fields of investment for the surplus capital of Europe and America. While many failures have been scored, the percentage of successful mining investments made in this country of late years is unusually high.

Mexico has upwards of 300 smelters of all sorts, mostly very crude, but with a few of the most modern type and of immense size, notable among the latter being the fine plants of the American Smelting and Refining Company at Aguascalientes, Monterey and San Luis Potosi. There are also fine reduction plants at the Boleo, Greene Consolidated, Descubridora and other copper mines of the country.

The Sonoran copper deposits are of the Carboniferous system of the Paleozoic group. The principal districts of northern Sonora are La Cananea and Nacos. These are but a short distance south of the Arizona line, and the geological, geographical and climatological conditions are practically the same as in the Bisbee district of Arizona, or, rather, the Bisbee, Nacos and Cananea fields are one district, divided by the international boundary line, and these fields, considered as one district, have furnished perhaps the most important copper mining developments noted on the globe during the past five years. There are other promising districts in Sonora, where devel-

opment work is in progress, but they have been overshadowed by the spectacular rise of the Cananea mines.

In Lower California there are some 30 copper mines of all classes, mostly insignificant, but the Boleo, operated by a French company, is a property of the first magnitude. This mine is opened on beds occurring in a formation of Tertiary sandstones, conglomerates and tufas. The cupriferous beds, three in number, of large area, lie upon conglomerates of varying horizons and are overlaid by argillaceous tufas, all traversed by fissures. In the upper bed, above the water level, the ores are disseminated oxidized ores, such as melaconitë, cuprite, atacamite, azurite, malachite, crednerite and chrysocolla, all in quantities of commercial importance. In the second ore bed there are peculiar globular concretions of oxide and carbonate ores, called boleas, whence the name of the mine. The third bed, in addition to the oxide, carbonate, silicate and oxy-manganate ores, also carries sulphides, not the ordinary iron-sulphides, but chalcocite and covellite, the richest ores of copper. The ores are disseminated in irregular masses, veinlets and concretions, in a clayey tufa, with a marked tendency toward concentration upon the underlying conglomerates, where the ores occur compact in layers of 6 to 10 inches.

While Michoacan has not yet become a large producer, it has one very large property, the Inguaran, in process of development, and other properties of promise are also undergoing exploitation. The Ario district of Michoacan contains enormous bodies of sulphide ores, occurring quite evenly disseminated in granitic rock. It is obvious that these properties must be worked upon a very large scale to prove profitable, but as the Rothschilds are furnishing the money for the development of the largest mine, the district will receive the benefit of adequate capital in its development.

In the state of Coahuila there are several important mining developments. The same is true of Zacatecas and Durango. The state of Chiapas has some rich gold-copper mines, especially in the neighborhood of Santa Fe and Pichu-Calco. In the state of Guerrero there are good copper ore bodies, and a newly organized American company is preparing to develop mines on a large scale, south of the Balsas river in the districts of Braves and Travares, less than 40 miles from Acapulco, which lies on the Pacific coast. The claims made for this property are simply staggering, and if they did not come from an apparently responsible source, would be laughed at as preposterous.

COSTA RICA. There are outcrops of copper ores at several points in the republic, but no attempt has ever been made at opening mines.

CUBA. Copper ores occur at many points in the eastern part of the republic, and the province of Santiago was the scene of the first copper mining done in the new world. El Cobre mines, situated some thirty miles north of the city of Santiago, in the Sierra Madre mountains, were opened in the Sixteenth century and were worked with more or less regularity until 1834,

when the various mines of the district were bought by an English company and consolidated. From thence until 1868 the production averaged one million dollars in annual value. The richest ore was shipped direct to Swansea, while the low-grade ore was discarded and the medium quality reduced to matte for export to the smelters. The mines were opened to the depth of nearly a quarter of a mile and were equipped with excellent machinery and buildings. In the rebellion of 1868 the torch was applied by insurgents and the extensive plant entirely burned, since which time the mines have been idle, although a little copper has been obtained every year by natural cementation. Steps are now being taken for the reopening of these mines, which, in view of their past production and profits, are doubtless worthy of the great cost that their reopening and equipment will entail. There are also promising copper deposits in the province of Pinar del Rio, and elsewhere.

GUATEMALA. Excellent specimens of sulphide copper ores have been found at various points in the republic of Guatemala, but no serious attempts have been made at developing these resources, and I am unable to find trace of anything worthy the name of a copper mine in the country.

HAYTI. Copper exists at several points in Hayti, notably in the Hotte Mountain range in the southern part of the country. Previous mining developments have been of the crudest, but an attempt is now being made, under American management, to open regular mines of copper.

HONDURAS. There is copper ore in nearly every department of the little Central American republic of Honduras, but the development of mineral industries is not equal to the possibilities offered, and the only copper producer worthy of the name is the Eureka mine, in Orica Basin, department of Tegucigalpa, where a small production of gold, silver and copper is effected.

JAMAICA. Small copper mines were opened at several places in Jamaica many years ago, but the ore bodies proved meagre, so far as exploited, and the mines, being unprofitable, were soon abandoned. There are indications of copper and other metals at many points on the island.

NICARAGUA. A very limited amount of copper is produced in Nicaragua as a by-product from the smelting of silver ores. There are promising undeveloped copper ores in the department of Nueva Segovia, the development of which is rendered difficult by a mountainous country and poor roads. There are also occurrences of copper ores in the departments of Leon, Jinotega and Matagalpa, and in the district of Prinzapulca.

PORTO RICO. Copper ores occur at several points on this island, but, so far as can be ascertained, no serious attempts have ever been made to develop mines thereon.

SAN SALVADOR. There are deposits of copper ore at several points

in the republic of San Salvador, but efforts to secure details regarding them have not been rewarded as yet.

SANTO DOMINGO. There are copper, gold and silver ores in the San Francisco Mountains of the department of San Cristobal, and during the year 1900 concessions were issued to Señor Don Antonia Nascia for copper mining at Barrero, San Cristobal, to Señor Francisco Sezzato for copper mining in the same department, and to Señor Francisco Diaz for copper mining.

CHAPTER X.

COPPER DEPOSITS OF SOUTH AMERICA.

The various copper producing fields of this continent are treated alphabetically, by countries, in the pages of this chapter. The cupriferous measures of South America are of vast extent and great value, though as yet having but comparatively small development, except in Chile.

ARGENTINA. The Cordilleran copper belt that traverses portions of Bolivia, Peru and Chile is also found in the Argentine Republic, on the eastern slope of the Andes, in the departments of Tucuman, Cordoba, San Juan, La Rioja and elsewhere, and several mines, notable among which are the Rosario, Carmelita and Restauradora, have been developed, but have never been extensive producers, owing to the primitive methods used in mining and smelting, and the even more primitive means of transport employed, thirty mules being required to carry a ton of ore from the mines to the smelter. A wire rope tramway discounts mule power for such uses. Under such adverse circumstances it is scarcely surprising that Argentina made only 76 metric tons of copper in 1900.

A recently discovered copper deposit near Los Morteros assays 40 to 50 per cent. copper and is said to be well located for economical operation. The principal copper developments within the limits of the republic have been in the Cerro de Capillitas district, where a mass of fissure veins, forming almost a gigantic stockwerk, occur in granite, gneiss and porphyry, with a capping of trachyte. The ores developed in this district are tenorite, cuprite, malachite and azurite, with some bornite and occasional argentiferous tetrahedrite. It is possible that chalcopyrite will come in at greater depth, but the richer ores in the alteration zone are evidently of considerable depth, and are both auriferous and argentiferous as a rule. An English company now owns a number of the best properties of the Cerro de Capillitas district and can scarcely miss making a rich mine, if the large sums necessary for roads and modern machinery are expended judiciously.

BRAZIL. The existence of native copper and copper ores in Brazil has been known for many years, but until very recently no systematic attempt has been made at mining, and no official records kept of discoveries and operations. In fact, no information whatever has been obtained from any of the government officials, on the subject of copper deposits.

A mass of native copper weighing 2,616 pounds was uncovered many years ago, in the neighborhood of Bahia, and now reposes in the royal museum at Lisbon. Copper ores have been found, from time to time, at various

points in Brazil, among the more important localities of occurrence being Ouro Preto, Camaquã, Pelotas and various points in the state of Minas Geraes, which has long been noted for its large and profitable gold production. The only systematic work now under way in the republic is near Lavras, Minas Geraes, where a copper deposit found in the spring of 1901 gave assays running up to 75 per cent. metallic copper. This is owned by a company recently organized in Brussels, and thorough development is promised by the new owners.

BOLIVIA. The Andean copper belt of South America reaches through Argentina, Chile, Peru, and Bolivia, and general geological conditions are much the same in the cupriferous districts of all four countries. The exploitation of Bolivian copper mines has been hampered by lack of cheap and efficient transportation, and highly skilled labor is also hard to get and keep. All of the copper produced in this country is shipped through the Peruvian port of Mollendo.

The principal and at present the only active Bolivian copper mines are in the district of Coro Coro, department of La Paz. In this district there are two dissimilar sedimentary formations, apparently of different geological periods, similar only in their origin and cupriferous nature. The older and underlying formation, "Las Vetas," is an arenaceous conglomerate with argillaceous tendencies, having a northeasterly trend. Superimposed upon this stratum is another conglomerate, "Los Ramos," having a southwesterly trend. The upper conglomerate is much like the lower, but is darker in color and mottled with red and whitish particles of gypsum and other minerals not found in the older stratum. In many respects the La Paz field more closely resembles the Lake Superior copper district than any other. The country rocks are eruptive, mainly dioritic, and the copper is found native, as a rule, and only rarely as ores in quantities of commercial importance. Like the Calumet and Allouez conglomerates of the Lake Superior district, the Bolivian conglomerates carry the native metal in fine nodules, although masses, usually small, but sometimes very large, are occasionally encountered. Another point of resemblance is the occurrence of silver, always native, found associated with the copper, but never alloyed with it.

Next to La Paz, the most promising and farthest advanced district is that of Pacajos, where the output reached 1,000 quintals weekly in June of 1900. The same general conditions of labor and transportation govern in this district as in La Paz.

CHILE. Although Chile led the world in copper production about the beginning of the last quarter of the Nineteenth century, that country has lost ground as a producer, not only relatively, but actually. There is reason to believe, however, that the tide has turned, and the output for 1901 was the largest secured for many years. The secret of the sudden rise of Chile, its arrested progress, decline and final rejuvenation as a copper producer is found in the combination of geological, geographical and metallurgical conditions

under which the copper industry had its birth, its period of prosperity, its decline and its renaissance. There is copper ore in every province, and in nearly every district of every province of the republic. The ease with which the oxidized surface ores were secured and smelted gave rise to a large industry, but, like a fire of kindling wood, while quick and hot the industry was of short life, because the altered ores gave way at depth to the low-grade iron-sulphides. These are now being mined in increasing quantities, and the Chilean copper industry is more firmly established at present than at the height of its former prosperity, even though the annual production be smaller.

Copper deposits were worked in a limited way before the first white man set foot upon the soil of Chile. Under Spanish dominion a little copper was produced, but the industry did not begin to expand largely until the achievement of independence, about the third decade of the Nineteenth century, after which mining flourished greatly. Until 1842 the high-grade oxide and carbonate ores were smelted in charcoal furnaces, but in that year the first reverberatory furnace was built at Coquimbo, by C. Lambert, and in 1857 the first blast furnace was built by the same man. The period of greatest prosperity of the Chilean copper industry begun about 1850, and continued for nearly thirty years, after which there was a period of twenty years during which the industry lost ground slowly but steadily, this depression being followed by the beginning of better times, just at the close of the century. In 1881 Chile, Spain and the United States, the three greatest producers, made about the same amount of copper each, Chile having a slight lead with a trifle more than 41,000 long tons. From that point the output slowly declined to about 25,000 tons, fifteen years later.

Chile has two parallel copper belts, running nearly due north and south, and approximately one hundred miles apart. The principal development has been made in the western, or coastal belt, because of the greater ease of exploitation and transportation. The country rock of the Chilean cupriferous districts is composed mainly of strata of the Permian system, sandstones predominating. These have been extensively faulted, twisted, broken and upheaved by eruptive diorites. The general geological conditions are much the same as are found in the Mansfeld district of Germany, and in the governments of Perm and Elizabethpol in Russia. The Cordilleran belt, which lies back from the coast some distance in a country about as rugged as can be found anywhere, is so difficult of access, in most cases, that but little mining development has been secured, especially in the case of copper ores, on which the cost of transportation is so great as to preclude operations in any but the most favored districts. The two parallel copper-bearing belts stretch from Argentina on the south, into Peru on the northern boundary.

Summarizing from Prof. Ch. Vattier's excellent little brochure, "*Mineria i Metalurjia de Chile*," the principal copper-bearing districts of the country, as developed, are as follows, from south to north:

In the provinces of Santiago and Valparaiso is the mineral center of Las Condes, and the rich sulphide mines of Los Elguin, Bronces and Transito, with other centers of activity, as at Naltagua, Los Aguirre, Tiltit and Lampa.

In the province of Aconcagua are the well-known mines of Catemu, with the Melon group and other less-known properties. Lying next north comes the province of Coquimbo, ranking among the most important as a copper producer. The principal mines are in the departments of Combarbala, Illapel and Ovalle, including such first-rate mines as the Panulcillo and others less known. The province of Atacama is at present the greatest copper producer of the country. In the department of Vallenar there are numerous mines, among which are the Camarones and San Antonio. The department of Freirina is the location of the great Carrizal mines, upper and lower, and of other important producers. In the department of Copiapo are such great mines as the Dulcinea, Puquios, Nantojo and Tierra Amarilla. The department of Chafaral is the site of the great mines of the same name. The province of Antofagasta is among the greatest copper centers of the country, and has large and important mines in the departments of Taltal, where the mine Exploradora is located; in the neighborhood of Calama, department of Antofagasta, and in the department of Tocopilla.

The Cerro Blanco district is not on the coastal belt, but is located in the Cordilleran zone, the mines being opened principally in trachyte. These were originally opened for silver, but at the depth of about 600 feet a zone of rich copper-silver ore was encountered, and this, in turn, was succeeded at greater depth by unaltered iron-sulphides of good average values. The deepest mine of the district is the Agua Amarilla, which has reached a depth exceeding 1,500 feet.

Among the discouraging features of the Chilean copper trade, for the past twenty years, have been lack of railroads, inefficient labor, high wages and lessened values of ore bodies in the case of the older and deeper mines. Transportation facilities have been greatly improved during the past decade, the enlightened and progressive government of Chile having fostered railroad building, as well as taking a deep interest in the development of the mineral and other natural resources of the republic. General conditions are improving, slowly but surely, and Chile from now on should show gains in copper production. The resources of the republic in this mineral are scarcely excelled by any country except the United States.

COLOMBIA. While the republic of Colombia is noted for its production of gold and silver, little attention has been paid to mining for other than the precious metals. The existence of copper has long been known, but heretofore no attempts have been made at mining in any but the crudest manner, though small quantities of the rich oxidized ores near surface have been extracted at various points, from time to time.

Copper ores are known to exist in many departments, notable among which are Tolima, Rio Blanca, and Cauca. Among the principal deposits of Cauca are those of San Lorenzo, Yocoto, Coli, Richinche and Andagueda. The principal mining districts of Colima are those of Anchique, Fiscal and Nacoroco, lying southwest of Natagaima. The International Colonizing

Company, of New York, has extensive concessions in this district, on which good bodies of copper ore have been located.

ECUADOR. While there are no working mines in this republic, the existence of copper ores at various points has long been known. One of the most recent and most important discoveries was made in 1900 in the province of Ahuay, about 35 miles from the coast, where a promising deposit of copper ore was discovered, at an elevation of about one mile above sea-level.

PARAGUAY. There are deposits of copper ore in the northern part of Paraguay, but details regarding the size, richness and probable value of the veins are not obtainable.

PERU. The rapidly growing copper industry of Peru suffered a rude shock in the decline of the metal's market price, and production fell off greatly during 1902. The very extensive operations put under way by the Cerro de Pasco company will result, within the next few years, in giving to Peru the largest and best equipped mining and smelting plant on the South American continent, and the example thus set is quite certain to have a highly beneficial effect on the Peruvian copper industry as a whole.

The Andean copper zone of Argentina, Chile and Bolivia is also found in Peru, and copper mines have been opened at a number of different points. According to the reports of the Minister de Fomento for 1900, there were 104 copper mines, an equal number of cupriferous silver mines and two mines of gold, silver and copper, within the boundaries of the republic. The government now has two surveying parties in the field, especially to delimit the copper-bearing districts, but their work will necessarily require a long time for completion. Mine owners furnish no reports to the government, and authenticated facts regarding the copper measures and copper mines of Peru are difficult to obtain from any source.

Peru was once a considerable producer of copper from various districts, but the industry fell into decay until late in the Nineteenth century, when there was a revival, stimulated by the high price of the metal. A limited amount of copper is produced as a by-product in the smelting of cupriferous silver ores. The principal mines of the republic are found in the four districts of Ica, Yauli, Acari and Cerro de Pasco, with minor properties in the districts of Mollendo, Moquega and Huarochiri.

The Ica district was once worked extensively, but was abandoned in 1892. Its largest mine is the Canza. The ores averaged about 30 per cent. copper, the lower grades being rejected. The drawbacks in this district are lack of water and good roads. The mines of Yauli, including the adjacent district of Morrococha, are located at an elevation of upwards of 13,000 feet above sea level. This field was once a considerable copper producer, but work was stopped for the same reason as in the Ica district. More or less silver is still mined, and some high grade copper ore averaging 26 per cent. in tenor is still being mined. The San Francisco is the principal mine of the Yauli

district. The Acari district in the province of Camana has a number of small mines, but there is little activity at present. In the other minor districts conditions are practically the same.

The Cerro de Pasco district has always been the principal field of Peruvian copper production, and with the work now under way by the American company will speedily assume a commanding position, not only in Peru, but in all of South America. This district has been worked in a desultory fashion for 300 years, but serious development along modern lines was begun as recently as 1897. The district occupies a basin in the Cordilleras, at an elevation of 14,000 feet, and is most difficult of access. Unlike the other Peruvian fields, which are arid, there is an excess of water at Cerro de Pasco. The ores that have been worked hitherto have ranged in tenor from 25 to 40 per cent. copper. The lower grade ores, of which there are large bodies, have remained untouched, or were discarded after mining, only the richest ores being able to pay for the heavy costs of refining and transportation. The freight rate, for transportation on the backs of mules and llamas, is \$40 per ton between the mines and Oroya, the terminus of the Meiggs railroad running from Callao into the Andes. The difficulty of getting out copper and getting in machinery and supplies, upon the backs of pack-animals, over the roughest of mountain trails, can only be understood by those that have had experience. The Cerro de Pasco company has secured control of the old Meiggs railroad, one of the engineering marvels of the world, and will continue the line to the mines from its present eastern terminus at Oroya. This extension was begun in the spring of 1901, and is proceeding uninterruptedly and successfully, though the problems to be met and overcome are certainly among the most stupendous ever attacked by courageous engineers. The expenditures of the company on the mines and railroad are already estimated at seven millions of dollars, and millions more must be devoted to the completion of the work. Fortunately there is no question of the ability of the company to raise any amount necessary.

URUGUAY. There is copper ore in Uruguay, but, so far as can be ascertained, there are no copper mines, and no serious attempt has ever been made at exploiting the copper deposits.

VENEZUELA. This country was once a considerable producer of copper, and is estimated to have made about 65,000 long tons of refined metal in the period 1872-1894, in which latter year the mines of the Aroa or Quebrada district were closed down. The principal cupriferous district of Venezuela is found on the Narvaez or Bolivar tract, between the Tocuyo river on the north and the Yaracuy on the south. This tract extends some 54 miles in an approximately east and west direction, comprising 1,150 square miles. These lands were granted to one Narvaez by the Spanish crown, in 1598, and in 1802 passed, by marriage, into the hands of Simon Bolivar, the liberator. This tract, on which a number of mines were opened, is now owned by a London syndicate. The mines of the Quebrada district, lying on the Aroa river, are included in the lands of this extensive estate. The igneous country rocks

are of slate and limestone, with various intrusive rocks. Copper is found in lenticular masses, frequently of considerable size and unknown depth, the series of lenses having a strike nearly north and south. The ores are oxides and carbonates at and near surface, followed at slight depth by iron sulphides.

There are traditions that these mines were worked by the Indians before the coming of the Spanish. Early in the Nineteenth century, a Baltimore company operated several of the mines, and secured about 43,000 tons of high-grade carbonate and oxide ores. Later on Venezuelan capitalists took the mines and removed about 100,000 tons of high and medium grade ores. The Quebrada district will doubtless be given attention at some future time, but just at present political conditions in Venezuela are not satisfactory, and the enlistment of foreign capital, absolutely necessary for the development of the mines, is rendered difficult by the complaints of ill-treatment made by European and American moneyed men who have invested large sums in various mining and land enterprises in this republic.

CHAPTER XI.

COPPER DEPOSITS OF EUROPE.

Brief descriptions of the principal copper measures and developments of Europe are given, under the names of the respective countries possessing cupriferous deposits and mines, in this chapter, the titles being arranged alphabetically.

AUSTRIA. The total annual production of refined copper by Austria is about 2,000,000 pounds. Copper has been mined and smelted for hundreds of years, but none of the mines now active are worked on a large scale, and the mining and metallurgical plants are by no means modern in design.

Copper deposits are found in various parts of the empire, and mines are worked in a small way at several points, the principal of which is Kitzbuehel, in the Tyrol. There are other Tyrolean mines, all of quite insignificant production, and a few small producers at Salzburg. The Graslitz mine, in Bohemia, was a very large producer during the middle ages, but was abandoned in the Eighteenth century.

BOSNIA. Copper ores are mined in a small way at several points in Bosnia. Ore is mined and smelted at Sinjako, while the ores from other points are sent, in limited quantities, to Hungary for reduction. Bosnia and Herzegovina, which are under the protection of Austria, are usually lumped with the dual monarchy of Austria-Hungary in figures of production. The output for 1901 was 237 tons of refined copper, made from 4,747 tons of ore, of which 1,040 tons were fahlerz.

BULGARIA. There is ample evidence that mines of copper were worked within the present limits of Bulgaria during the days of Roman dominion, and possibly in even earlier times. At Plakalnitza, in the department of Vratza, there are considerable slag-piles from ancient smelters, dating from a time so remote that no vestiges of the works themselves are to be found, and in other departments of the principality there are similar but smaller slag-piles and waste-burrows of refuse containing traces of lean ore, the values of which have been effectually leached out by the rains of two thousand years.

At Plakalnitza the ore is mainly bornite, with a little malachite and chalcopyrite. At Kara Bair, near the port of Bourgos on the Black Sea, chalcopyrite is found in considerable profusion, and copper mines were evidently worked there at some remote period. At Milkiovtzy in the district of Trn, there are small deposits of chalcopyrite, chalcocite and malachite, in a barytic gangue. There is also chalcopyrite at Belogradchik, where some work is now

being done. Chalcocite is found at Gornya-Banya and at other points in the department of Sofia, not far from the capital city, and in the districts of Sleven and Samokof native copper and oxide ores have been found.

CORSICA. There are a number of old copper mines in Corsica, of which one, the Lancone, was once a considerable producer.

CYPRUS. The Latin word *cuprum*, from which comes the English word copper, was derived from the name of this island, thus attesting its ancience as a source of copper. In ages long past there were extensive copper mines on the island, but the production at the present time is trivial, exports for 1899, the largest for some years, having been but 36 metric tons. One English corporation is now operating on the island.

ENGLAND. Copper and tin have been mined in Cornwall and Devon from very remote times, possibly for three thousand years. Oxide and carbonate ores occur in the conglomerates and sandstones of Cheshire, and these were once mined to some extent. Cumberland also had copper mines some centuries ago, and the Goldscope was England's most famous copper mine during the Tudor era, working a fabulously large force of men to get the very moderate amount of copper that was secured. During the first half of the Nineteenth century Cornwall and Devon were the world's largest producers of copper. The importance of England, as a source of copper supply, received a check from the development of the richer ores of Chile, and when Lake Superior, South Africa and Australia entered the field of production, the English output began to decline, until it now averages only about a million pounds yearly.

The copper ores of Cornwall and Devon, adjoining counties in the southwestern part of the island, are found in a clay-slate of the Devonian system having frequent bosses and veins of granite, with both slate and granite intruded by a quartz-porphyry. The veins are narrow, three feet being a liberal average, and are frequently capped with gossan, this capping being more common over the copper veins than above the veins carrying tin stuff. Veins of copper seem to favor the slates, while tin takes more kindly to the granite, but these observations hold true in a general way only, as there are many exceptions to the rule, while tin is frequent in copper mines, and copper is of common occurrence in the tin mines, and in places tin and copper alternate in occurrence. As a rule the richest portions of a mine are found where the veins have the sharpest dip. Native copper, while rarely found in quantities of commercial importance, is by no means uncommon, and is found in serpentine at the Lizard. One mass of native copper weighing three tons was secured from a mine near Mullion, Cornwall. The ores of copper are of many varieties, most of the more common sorts occurring, while many of the rarer copper minerals have been found, from time to time, in these two counties.

FAROE ISLANDS. Native copper, associated with mesotype, occurs disseminated in amygdaloid rock in these islands, but no attempt at mining has ever been made, so far as known.

FINLAND. Copper ore is found at several points in Finland, but the only active mines in the grand duchy are at Pitkaranta, where chalcopyrite in sahlite occurs in a granite country rock. These mines have been worked for many years and produce about one million pounds of refined copper annually.

FRANCE. The wealth of France is in her fertile soil, and not in her minerals. Copper ores are found at various points and a number of mines have been opened, but none of them ever proved either large or very profitable, and at present the production of copper from French mines is insignificant, having amounted to only 201 metric tons for the year 1900, the latest figures obtainable from the government bureau of mines. There are copper mines in the department of Var, Gard and Corse, also in Savoy and in the Basse-Pyrénées near the Spanish frontier. Argentiferous copper ore to the extent of 1,184 tons was exported to England in 1900 from the department of Ariège. In the same year 837 tons of iron-copper pyrites were exported to the same country, from the department of Corse, and 115 tons of copper ore were mined in the department of Gard.

GERMANY. The copper mines of Germany rank second in importance in Europe only to those of Spain and Portugal. The industry is one of considerable antiquity, and the history of the Mansfeld mines can readily be traced back to A. D. 1199, in which year the first copper was mined. The Mansfeld district, near Eisleben, in the Southern Hartz mountains, is much the most important in the empire. In this district the ore is found in beds of the Permian system, resting unconformably on crystallized strata of Paleozoic rocks. The eldest of the Permian rocks is a sandstone of several hundred feet in thickness, superimposed upon which is a second sandstone of little depth, upon which, in turn, rests the celebrated "kupferschiefer," or copper-bearing shale, a clayey slate averaging but two or three feet in thickness, and carrying a disseminated sulphide ore returning an average of about 2.5 per cent. metallic copper. The upper sandstone lying next below the kupferschiefer is also copper-bearing to some extent, and is worked at times. The area of the kupferschiefer is very great, probably nearly 200 square miles, and a number of square miles have been worked out and many miles worked over in the seven hundred years that the mines have been in operation. The Mansfeld district is notable for the possession of coal for fuel and limestone for fluxing, in the rocks above the copper-bearing strata, and ore, fuel and flux are sometimes mined from the same shaft.

There are also copper-bearing measures of lesser importance at Goslar, in Prussian Saxony; at Rammelsberg, in Nassau, and still less important ore bodies at several other points in the empire.

HERZEGOVINA. The industrial statistics of this semi-independent little country are usually included with those of Bosnia in the figures of the dual monarchy of Austria-Hungary, as Bosnia and Herzegovina are under the protection of Austria, since the congress of Berlin in 1878. The joint production of copper by Bosnia and Herzegovina reached 237 tons in 1901. Operations

are carried on in a most primitive manner, at the few points where any copper mining is done.

HUNGARY. The kingdom of Hungary has about a dozen copper smelters, all small and none modern in design or practice. Copper is mined at a number of different points, the sulphide ores predominating, and the industry is one of great antiquity in this country, but has made comparatively little progress of late, the production remaining practically stationary. The principal mines are in the vicinity of Resbanya and Dognacaka, though even the largest mines are not big producers, and there are a number of small properties from which a few hundred tons of ore are extracted annually.

IRELAND. The copper production of Ireland is insignificant at present, averaging possibly 20 tons yearly, and is secured by cementation from the waters leaching from old mine openings. There are three copper districts in the island, these being the Wicklow, Waterford and Cork and Kerry fields. In the Avoca valley of Wicklow sulphide ores occur in clay slates, much as in Cornwall and Devon. The industry was once important and in 1799 the Connecree mines yielded 677 tons of refined copper, which was a big product for those days. The 1899 production was 17 tons, obtained by leaching and cementation.

In the vicinity of Knockmahon, in County Waterford, the ores are also sulphides in clay slates, and averaged about 10 per cent. copper when worked. In 1843 the output of finished copper was upwards of 900 tons. In the southern part of Cork and Kerry large mines were opened during the Eighteenth and early Nineteenth centuries, the Mountain and Keallonge mines each being more than a quarter mile in depth, while there were other considerable properties at Berehaven and Lackamore, and on Ross island. All these have been idle for some years.

ITALY. Copper was mined in Italy previous to the Christian era by the Romans, and before their day the metal had been extracted by the Etruscans. The industry has had its ebb and flow, but has never been entirely at a standstill, for more than two thousand years. There are a few mines with fairly modern equipments, but as a rule the properties are worked upon a somewhat narrow scale.

The principal copper districts of Italy are four in number, viz.: Volterrano, Grosseto, Liguria and the western Alpine region. The ores of the Volterrano district, mainly chalcopyrite, with a little chalcocite, are found in a red gabbro known locally as porfido rosso. This district has been the scene of copper mining operations from the earliest times of which authenticated records remain.

The Grosseto district is now producing considerable copper from ores occurring both as contact and fissure veins. The Val Castruccio, Bocchegiano, Montecatini and Capanne Vecchie are the principal mines of this district, and the principal mining center is Massa Maritima, the *Massa Metallifera* of Roman days.

The Ligurian mines lie near the coast of the Mediterranean, above Genoa. The copper ores are found in stratified azoic rocks, as contact veins lying between the diorite or serpentine and the metamorphic rocks, the gangue of the sulphide ores being quartzite.

In the Piedmont district mines were worked in Roman days, and traces of old workings are to be seen at many points. The ores occur in stratified archaic rocks, no fissure veins being found, and nickel and cobalt are frequently associated with the copper, the Calcante being a typical example of the copper-nickel mines of the district. A little native copper is found in some of the Italian mines. In 1900 there were 16 productive mines in the kingdom.

NORWAY. There are considerable deposits of copper ore in Norway, the principal district being near Trondhjem, where the sulphide ores lie in schists and slates of the lower Silurian system. Ores are also found in Telemarken in a granitic country rock, and copper ore is mined to a greater or less extent in the ams of Trondhjem, Stavanager, Nordland and Finmarken, the principal mines being in the Sulitjelma and Roros districts and in Stavanager and Tromsøe. A number of Norwegian copper mines lie to the northward of the Arctic circle. The production of copper from the mines of this kingdom is slowly increasing.

PORTUGAL. Much of what appears under the title of Spain applies to the copper deposits of Portugal as well, and to save needless repetition the reader is referred to the article on Spanish copper deposits in this chapter, for a general description of the cupriferous measures of the Sierra Morena, of which the mines of San Domingos and Grandola, in Portugal, form the western extension. The principal mining fields are the San Domíngos, Grandola and Aljustral districts, with lesser properties developed in the Algarve and Aveiro districts. The San Domingos is much the most important mine of the kingdom.

Owing to the close propinquity of the Spanish and Portuguese copper districts, and the operation of mines in both kingdoms by the same English companies, the outputs of both countries are usually lumped in statistics of production. The Portuguese production in 1901 was equivalent to 9,933 metric tons.

ROUMANIA. There are copper deposits, apparently of importance, in this country. In the Carpathian Mountains chalcopyrite and carbonate ores are found at Valea Choboroasa, these assaying 7 per cent. cupric oxide, with a little gold. Samples of ore from Salishta gave 18 to 32 per cent. cupric oxide and 100 grams gold per ton. Carbonate ores have been found in promising quantities in the district of Dobroudja, at the towns of Balabancea, Islam-Gefer, Carapelit and at Altan-Tepe near Tcheamouri.

RUSSIA. There are extensive copper-bearing measures in the empire of Russia, those of Siberia being separately treated in the chapter on Asiatic copper deposits. As a rule the copper is found in rocks of the Permian system,

the name of which was taken from the heavy outcrops found in the government of Perm, where many of the principal Russian copper mines are located.

The principal mines of European Russia are in the governments of Perm, Elizabethpol, Orenburg, Kutais, Tiflis, Nijni Tagilsk and Viatka. Two of the three principal copper producing properties of the empire are in the government of Perm, and these make more than one-half of the Russian production. The Bogoslovski works turned out 72,961 poods of finished copper and the Rudianski works made 86,473 poods, in 1900. The Kargalinski works, in the government of Orenburg, made 18,849 poods in the same year. The governments of Perm and Orenburg are in the Ural Mountain region.

In the Caucasus region are the mines of the governments of Tiflis and Kutais. The largest producer is the Dzansulski, in the government of Kutais, with an output of about 14,000 poods. The Metiiski works, in the same government, made 4,544 poods in 1900, and the Alverdski and Shamblurgski works in the government of Tiflis produced 4,490 poods in 1900. The production of refined copper by the mines of the entire Russian empire, including Siberia and Finland, amounted to 7,534 metric tons, in 1899, the latest year for which official figures are available.

There are a number of old mines in the empire, of little productive importance at present, such as the Miednoroudianski, in the government of Nijni Tagilsk, famous for its massive malachite, a single mass weighing 330 tons having been taken from this mine in 1836. The Kiadebek, or Kadabenski mine, in the Elizabethpol district, is operated by German capital, and is one of the most important mines of the empire, though no figures of production, other than mere estimates, are available for present use.

There are about thirty smelting plants for copper operated in the empire, including those in Siberia. Most of these are small and antiquated, though there are a few that are fairly modern. Judging from the immense extent of the copper-bearing measures, and the good grades of ore secured in the better mines, there is a future ahead of the Russian copper industry, much brighter than might be inferred from the limited development secured in the centuries that have elapsed since copper was first mined and smelted.

SCOTLAND. There are deposits of chalcopyrite in Perthshire, Kirkcudbrightshire, and at several other points in Scotland, but no copper mining is done.

SERVIA. Copper mines have been operated, on a limited scale for many centuries in Servia. There are old mines and a few active properties at a number of points, but the principal copper producers are in the vicinity of Majdanpec. The production of refined copper from Servian mines was 270 metric tons in 1900.

SPAIN. The kingdom of Spain possesses great mineral wealth, and in the value of its copper and iron measures leads all the other countries of Europe. Copper ores are found in Huelva, Alicante, Almeria, Asturias, Badajos, Barcelona, Burgos, Caceres, Castellon, Coruña, Cuenca, Gerona,

Granada, Guadalajara, Huesca, Jaen, Leon, Lerida, Logrono, Madrid, Malaga, Minorca, Navarra, Palencia, Santander, Segovia, Sevilla, Taragona, and Teruel, and in all of these copper mines have been opened. Mining is being done at present in a number of these provinces, but the preponderating production of the kingdom comes from the mines of Huelva. This district is in the Sierra Morena of the province of Huelva in southwestern Spain, and the cupriferous formation continues into the adjoining kingdom of Portugal. This district is said to be some 30 miles wide by 150 in length, extending from Aznalcollar in Sevilla to San Domingos in Portugal, but the limits of the demonstratedly profitable zone are much more circumscribed. The Sierra Morena, or Andevallo cupriferous belt as a whole, is divided into four zones. The eastern zone includes the Cerro Muriano and other mines near Sevilla, while the western zone is in Portugal, with the village of Grandola as an approximate center. The northern zone includes the principal mines of both Spain and Portugal, while the leading mines of the southern zone are the Tharsis, Castillo del Buitron, Lagunazo and Las Herrerias. All of these zones present the same general characteristics, having lenticular masses of ore that parallel the layers of slate and the strike of the veins in the porphyry. The ore bodies are of varying size, sometimes of immense dimensions, the largest reaching a length of nearly 4,000 feet and an extreme width of 500 feet. These lenses are usually found at the junction of slate and porphyry. The slates are of the Paleozoic group and probably of the lower Carboniferous system. Their strike is northwesterly, and dip to the north. These slates are of a yellowish tinge at surface, where weathered, but bluish at a little depth. The slates have been intruded by porphyry, syenite and diabase, the porphyries occurring in a succession of parallel lenses with the same strike as the slates. The ore bodies are also parallel with the slates and porphyries, and may be considered true contact veins.

The ore bodies, below the shallow alteration zone at surface, are formed of an intimate mixture of chalcopyrite and pyrite, giving a disseminated sulphide ore of copper averaging 3 to 4 per cent. metal, though considerable ore of higher grade is encountered. The ores are slightly argentiferous and auriferous, and under the highly perfected processes of extraction now employed, the values of the precious metals are quite closely extracted, and small as is their percentage this saving amounts in the aggregate to large sums, owing to the immense tonnage of ore treated annually. A strong tendency is noticed in the lower levels opened in these immense lenses toward decreased dimensions and lessened values.

References to the interesting metallurgical processes employed in the Hispano-Portuguese mines will be found in the chapter on metallurgy, and more detailed references to the geology of the various important mines will be found in the descriptions of the principal mines of Spain and Portugal.

The first copper mining in the Iberian peninsula was done, in all likelihood, by the Phoenicians, some 3,000 years ago, and was continued by the Carthaginians. The Romans succeeded to the dominion of the peninsula, and extensive traces of their work are yet to be found in the Sierra Morena.

Mine timbers, which in all likelihood were put in by Roman workmen nearly or quite two thousand years ago, are still in place, effectually protected from the gnawing tooth of time by the preservative action of the copper sulphate with which the mine waters are liberally charged. The modern era of Spanish copper production dates from 1860, when the Tharsis mine—the Tharsish of the ancients—was reopened. The Rio Tinto was reopened as recently as 1876.

SWEDEN. Copper has been mined in Sweden for more than 600 years, from the famous mines of Falun. The ore at this point is chalcopyrite occurring in connection with iron pyrites, and is found in lenses of considerable size. The Storra Kopparberg mine, near Falun, is the best-known property of the district, and furnishes much of the copper, some of the silver and most of the gold produced in the kingdom. Copper ores are found in the läns of Ostergotland, Malmohus, Orebro, Vestmanland and Kopparberg. There are mines in all of these districts, most of which are small producers or entirely idle. There are three smelters in Sweden, of which the most important is at Atvidaberg. In addition to the metal produced from direct smelting, a little copper is produced at Helsingborg by superphosphate works which extract the copper from the cupriferous iron pyrites residues, producing about 120 tons of cement copper annually. About 550 tons of blister copper is turned out from the smelters at Atvidaberg, Falun and Kafvelstorp, the copper production of the kingdom being insufficient to supply the domestic demand.

TURKEY. Extensive copper deposits exist at several points in the Balkans, on both the Bulgarian and Turkish sides of the mountains. The present copper production of Turkey is probably 3,000 to 4,000 metric tons yearly, of which amount the exports are about 2,500 tons, but these figures are estimates, except in the case of exports. Of exports of approximately 2,400 metric tons made in 1900, the mines and smelters of Arghana Maden sent about 1,400 tons, while about 1,000 tons came from Bakir Maden, near Diarbekir, Asiatic Turkey. The mines at Tokat were once considerable producers, but have fallen off latterly. Copper has been mined and smelted for some centuries near Kharput, and has been produced to a considerable extent by the mines of Kalabak, near Mount Ida, from time immemorial, having been ancient in the time of Strabo, who describes them. The ore at this point is chalcopyrite occurring in slates and limestones said to be of the Tertiary period.

WALES. The copper mines of Anglesea were worked by the Romans, and possibly by the Phoenicians before them. There were also considerable mines in Merionethshire, and up to about 1830 Wales was a considerable producer. At present the only copper production is a score or two tons produced yearly as cement copper from the water leaching out of the old Parys and Mona mines.

CHAPTER XII.

COPPER DEPOSITS OF AFRICA.

There are important developments in copper mining at several African points, and it is probable that the Dark Continent will become a much larger producer in the future than it ever has been in the past. The deposits and developments of this continent are treated alphabetically.

ABYSSINIA. The mineral wealth of Abyssinia is largely a matter of conjecture, but it is certain that copper exists at various points. The Negus Menelik, emperor of Abyssinia, has evidenced progressive tendencies since the Italian invasion of his country was repulsed and has encouraged foreign capital. It has been stated in press dispatches, published late in 1902, that mining and railroad concessions are being revoked, but the news has not been confirmed. Abyssinia is a mountainous country, lacking railroads or good wagon roads, and the development of copper mines is apt to await the securing of better transportation facilities.

ALGERIA. Chalcopyrite and antimonial gray copper ore (tetrahedrite) are the principal copper ores of Algeria. The gray copper found in Kabylia is somewhat argentiferous, and occurs in rocks of Jurassic age. The Am Barbar mine, in the department of Constantine, near the Tunisian frontier, has a rather remarkable lense of sulphide ore averaging 8 to 15 per cent. copper, absolutely isolated and enclosed in Ligurian schists. The copper is associated with galena and zinc blende. Along the Mediterranean coast, in the department of Constantine, there are a number of small veins, of no great depth, carrying sulphide ores, in a gangue of quartz. There are several mines of antimonial ores carrying more or less silver in the department of Alger, but none of them are worked at present.

ANGOLA. The existence of sulphide and carbonate ores, in considerable abundance, is reported from various points in Angola, but, so far as known, none of them have been opened, and no attempts at development are contemplated at present.

ASHANTI. The occurrence of native copper, apparently in dendritic forms, in the country several days' journey back from the Ivory Coast of Ashanti, is reported to me by Mr. John Nolan, of Sekondi, Ashanti, who is in charge of diamond drill explorations for gold, conducted by sundry English corporations.

BASUTOLAND. According to Sir Godfrey Lagden there are indications of copper, tin and iron in Basutoland.

CAPE COLONY. The copper production of Cape Colony comes exclusively from Namaqualand, on the west coast, the productive area lying in Little Namaqualand, about 90 miles from the Atlantic. All copper ore shipments are made through Port Nolloth, which ranks fourth in exports in this colony. There are two large companies operating in this district, and the first production was secured in 1852, since which time copper has been exported to the value of nearly \$60,000,000.

The ore is chiefly chalcopyrite, returning an average of 17 to 19 per cent. in smelting, these figures making it evident that considerable care is exercised in selection. The country rock is granitic, and the ore occurs in lenses, often of great size. The largest mine is the Ookiep, which is partly exhausted. Little Namaqualand has apparently been a decadent district for some years, but recent explorations have shown promising deposits for future exploitation. It is now purposed building a new railroad, which should prove a considerable stimulus to the development of new mines.

CONGO FREE STATE. The existence of copper ore deposits, some of which are apparently of workable size and richness, has been known for years, but no mining worthy of the name has ever been done. The natives of the upper Congo dig a little iron and copper ore and smelt them with charcoal in pits, for the making of weapons and utensils. At Katanga there are several workable deposits, the ore occurring as lenses in schistose sandstones. At Mboko-Songo a few small mines have been opened in limestone. Ore has also been found in Yambingo, at Manyanga, and near the western shore of Lake Albert Nyanza.

FRENCH CONGO. Copper ore exists at several points in this colony and at least one mine is now in process of development, in the vicinity of Brazzaville.

GERMAN EAST AFRICA. The existence of copper in this protectorate has been reported, from time to time, but, so far as can be ascertained, no efforts have ever been made to develop regular mines on any of the deposits located.

GERMAN SOUTHWEST AFRICA. Copper ore has been found in this protectorate between the Swakab and Knisib rivers, and a mine is being developed at Windhoek by the Damaraland Copper Syndicate, Ltd.

GERMAN WEST AFRICA. It is reported to the German Colonial office that ores of copper, gold, silver and lead have been found in abundance at a spot about 400 miles inland from Walfisch Bay.

GOLD COAST OF AFRICA. The ores of a variety of valuable metals, including those of copper, have been found at various points in the interior of the Gold Coast of West Africa, but no attempt has been made at developing copper mines.

MADAGASCAR. Very little has been done as yet, either by the French government or private capital, for the development of the copper resources

of the great African island of Madagascar, although the copper measures already known would seem to warrant exploitation, or, at least, careful government inspection by trained scientists. There are native mines, worked in a crude way by the Hovas, at Ambataofaugehana in the district of Ambositra and at Vohinana. In this district there are two mountain caps, between which are extensive mica-schists of several miles in length. The ore is principally malachite, averaging 10 to 45 per cent. copper, and has sometimes been found carrying higher percentages. These mines are apparently about worked out. Other native mines are reported from the Betafo country. In this district of Imerinarive in the Cercle de Tsiafahy native copper has been found. The metal has also been found in virgin form in the district of Vonizongo. The country about Lake Kinkony in the Cercle of Mahavavy has long been reported rich in copper. According to some rather indefinite reports traces of copper have been discovered recently in the province of Vohemar.

MOROCCO. Though only three hours from Europe, Morocco is almost as effectively closed to civilization as though it were in the center of the Dark Continent. The country is reported to be rich in copper, as well as other minerals, but the sciences of statistics, geology and mineralogy have yet to be discovered in Morocco. Copper ore is found not far from Tangier, and was being mined and smelted, circa 1860, near Tarudant, capital of the province of Sus. This seems the latest authentic information to be had upon the copper deposits and industry of this kingdom.

NATAL. Copper ores exist in this colony, but little has been done in the way of exploration and no mines have been developed. The value of the discoveries made is largely a matter of conjecture.

NYASSALAND. The ores of copper, nickel and zinc have been discovered in Portuguese Nyassaland, but no attempts at mining have yet been made in the case of the copper ores.

RHODESIA. Prospecting for copper has been in progress for several years, and while Rhodesia has not gotten to the productive stage, there are good indications of payable copper mines being secured in the Lomagundi, Umtali and Victoria districts, and development work is now in progress in all of these districts, while copper ores have also been found in the Melselter district. Several strong British corporations are now at work in different parts of the colony, and thorough tests of the value of Rhodesian copper measures are quite certain to be secured.

Much the most important and most extensive development work is under way in the Victoria district, where copper has been found, apparently in large quantities, near the Kufekere river, a short distance north of the Victoria Falls of the Zambesi river. These falls are of immense height and volume, and are to be harnessed by the South Africa Chartered Company, which has engaged the services of Sir Douglass Fox and Sir Charles Metcalf as expert electrical engineers for devising the works, which, in all likelihood,

will be modeled quite closely along the lines of the immense electrical power installation at Niagara Falls. The plans of the company are drawn upon a most ambitious scale, and include the generation of sufficient power to operate not only the mines, but also a railroad line from the falls to the mines, and possibly also a railroad to the coal fields about 150 miles distant.

SENEGAL. Copper ores occur in the vicinity of the Senegal river, but details are lacking.

SUDAN. The only producing copper mine in the Anglo-Egyptian Sudan is the Hofret-el-Nahas, in southwest Kordofan, and this, owing to lack of adequate transportation, is worked solely for local consumption, mining and smelting being upon a primitive scale. Prospecting is now being done in various parts of the Sudan, but no copper has been found as yet, though there is thought to be copper in the Suakin district.

TRANSVAAL. Copper ore was discovered in this colony near Rustenberg, just previous to the outbreak of the Anglo-Boer war. The discovery is said to possess sufficient merit to warrant further attention.

UGANDA PROTECTORATE. Copper is vaguely reported from Uganda, somewhere between Lake Victoria Nyanza and the Nile, but precise information as to these discoveries seems lacking.

ZULULAND. Sulphide and silicate ores of copper have been discovered near the Insusi and Umhlatuzi rivers, in the Nkandhla district of Zululand. Apparently no attempts have been made to prove the possible value of these ore bodies, which are some distance from transportation lines.

CHAPTER XIII.

COPPER DEPOSITS OF ASIA.

As in the preceding chapters, the copper deposits of Asia are treated alphabetically, by countries.

AFGHANISTAN. The northern part of this country is said by travelers and natives to be rich in copper. Owing to the peculiar political position of the country, which is a buffer state between British and Russian possessions, industrial progress meets with discouraging obstacles. The development of modern copper mines demands railroads, and it is not probable that Great Britain would look with favoring eyes on railroad construction, as such lines would afford an advantage to Russia in case the latter country desired to invade India. The Russians, however, are pushing a transcontinental railway in the direction of northern Afghanistan, and this may lead, when completed, to the development of mineral resources now latent.

ANNAM. There are deposits of copper ore in the province of Quang-Nam, Annam, but detailed information as to the character and extent of the ores has not been secured for the present issue of this work.

ARABIA. There are deposits of copper ore near the shores of the Red Sea in Arabia Petrea, and a number of old mines are found on the slopes of Mt. Sinai. These mines, which yield turquoises as well as ore, were evidently never rich in metal. It is probable that they were the first copper mines ever opened, and the date of the first mining is probably as remote as 5000 B. C. The mines were the property of various nations, from time to time, and were the cause of various wars between the races coveting them, but were held mainly by the Egyptians. It is probable that after being worked for more than three thousand years they were finally abandoned before Moses led the children of Israel out of Egypt. The scepter of Pepi I, a Pharaoh of the Sixth dynasty, now preserved in the British Museum, is made of pure copper, and probably came from the mines of Mt. Sinai. The ore is chrysocolla in porphyry, and the ruined furnaces and slag piles found near the old adits, still open, show that the ore was smelted at the mines. Analyses of the slags do not show the use of fluxes in the reduction of the ores.

CHINA. Copper is of quite general occurrence in China, but owing to the lack of authentic records accessible to investigators from countries of better industrial development, details regarding many of the provinces are lacking. Copper mines have been worked for many centuries under

the most primitive methods of mining and smelting. The production of the empire is estimated at five million pounds annually, all of which is consumed in China.

Among the more important properties are those of the province of Yun-Nan, in southern China, where sulphide veins occur in limestone and sandstone strata near intrusive igneous rocks. The ore is both auriferous and argentiferous. Native metal is also found sparingly, in grains and small masses. The principal production of the empire is from this province, estimated at about 3,000,000 pounds yearly, of which upwards of 2,000,000 pounds are exported to other provinces. Kwei-Chau, also in southern China, produces a limited amount of copper, from ore bodies resembling those of Yun-Nan. There are also a few mines operated in primitive manner, with small production, at San-Kia-Tschang in the province of Ho-Nan, and a little mining is done in the province of Sze-Chuan.

The most modern copper mines and smelters are in Manchuria, and a new and well-equipped reduction plant has recently been completed at Kaya. With the industrial awakening of China, certain to come during the first quarter of the present century, the mineral resources of this vast empire will receive adequate attention, and while the immediate future holds out no promise of great mines, these will come in time.

COCHIN-CHINA. The existence of copper deposits, apparently of importance, is known in Cochin-China, but no mines are worked.

INDIA. Before the beginning of authentic history copper was mined and smelted in India, the production being secured along the simplest possible lines of digging and reduction. India was a considerable producer of the metal during the middle ages, and up to the beginning of the Nineteenth century, after which the output fell off slowly. During the Eighteenth century India shipped large quantities of copper to Europe, but the current was reversed later. The last active copper mining upon a considerable scale was done at Baragunda, from 1887 to 1891, but the chalcopyrite ore returned only 1 to 3 per cent. copper, and this was insufficient to permit a profit. A few tons of copper ore are still mined every year, and there are ore measures that will doubtless receive attention at some future time.

JAPAN. According to carefully-kept Japanese annals, copper was discovered about the beginning of the Eighth century. Mining and smelting were of the most primitive sort, the ore being reduced in clay pits, with charcoal for fuel. The first exports, other than to China, were made in the Seventeenth century, when Holland had a monopoly of Japanese trade, and copper was exported annually to the extent of 700 to 1,200 tons for many years.

After the opening of Japanese ports by Commodore Perry, in 1854, the Japanese were quick to realize the advantages of foreign technics and training. All branches of industry have been revolutionized in the past fifty years, and in no trade has greater progress been made than in the mining

and smelting of copper. Modern hoists and pumps, air compressors and power-drills, high explosives and other latest aids to mining have been applied, and Japan now has several strictly modern smelters. It must not be inferred that all Japanese copper mines are well equipped and operated in full accordance with the latest practice, for many of the mines are but little improved from the methods in vogue two hundred years ago, but the bulk of the production is secured under advantageous conditions, with excellent machinery, and under the direction of highly-trained engineers and metallurgists. Japanese mining men visit all of the important copper-producing fields of the world, and their practice ranks deservedly high.

Japanese copper ores are almost exclusively sulphides, and there are mines in nearly every province, though half of the 300 copper mines of the empire are idle, and there are but fifty mines or so that make fifty tons or more of refined metal yearly, while the bulk of the Japanese production comes from two groups of mines, the Ashio and the Besshi. Most of the copper ores carry silver, usually in quantities of commercial importance, while several mines have gold-copper ores, the gold values running as high as five ounces per ton in the selected ores of one mine. A little native copper is also found, as well as oxidized ores in limited quantities.

According to the latest available official figures, of date Jan. 1, 1900, the area covered by Japanese copper mines is 54,618,045 tsubo, a tsubo equalling 36 square feet, and mines covering 29,114,697 tsubo, or a little more than half the total area, were in operation. In addition, there were several mines of compound metals, from which a limited amount of copper was secured as a by-product.

The production of refined copper increased from 33,180,250 kin in 1894 to 40,459,709 kin in 1899, a kin being nearly equal to $1\frac{1}{4}$ pounds avordupois.

The most prominent figures in the Japanese copper industry are Messrs. Ichibei Furukawa of Tokyo, owner of the Ashio group, and Kichizayemon Sumitomo of Osaka, proprietor of the Besshi mines. Both have done much to modernize copper production in Japan, and to them their country owes a debt of gratitude for the breadth of view that led them, though gentlemen of the old school, to adopt the most modern improvements in their works, thus setting an example of great value as well as providing one of the most valuable exports of the empire.

KOREA. Copper ores are said to abound in this hermit kingdom, but details are scanty. A start has been made at gold mining with modern machinery and methods, and something will doubtless be done later with some of the more promising deposits of copper.

PERSIA. This country has long been known to be rich in copper, and there are mines, so called, in nearly every province, many of them very old. The methods of mining and smelting are of the crudest, and the production is necessarily small, being merely sufficient for the limited demands of the country itself. Until there are better railroad communications and foreign

capital can be enlisted in such enterprises but little will be heard from the copper mines of Persia.

SIBERIA. Copper deposits have been located at a number of points in Siberia, and a little mining has been done in several districts. The only mining of any importance now in progress is at Semipalitinsk, where the Pavovski mines and smelters turn out upwards of a million pounds of refined copper annually. The government of Semipalitinsk is rich in mineral resources, including coal and iron, and a large number of copper mining claims were located in 1900 and 1901, on few of which anything of importance has been done. The Akmolinsk district has received some attention from prospectors, and upwards of 100 copper claims have been registered in the Karakalinsk district. The value of these districts, judged by surface indications, is said to be considerable, but actual mining will be required to determine the true status of the new fields.

TONQUIN. There are copper mines, operated by natives on very crude principles, in the provinces of Sontay, Langson and Laokay, and the ores are said to be of good grade, although the production is necessarily small, owing to lack of modern machinery and methods.

TURKESTAN. There is one small mine, the Karankulski, in the Tashkent district of Turkestan, and there are other unworked ore bodies, some of which are apparently worthy of exploitation.

CHAPTER XIV.

COPPER DEPOSITS OF AUSTRALIA AND OCEANICA.

In this division of the earth the more important copper deposits and mines are developed in the commonwealth of Australasia, though there are beds of copper ore in New Caledonia and elsewhere that give promise of making good mines. The political divisions of Australia, Tasmania and New Zealand are first treated, after which references are made to the other islands in alphabetical order.

AUSTRALIA. The first copper shipment from this island continent was made in 1843, from South Australia, thus antedating the first production of Lake Superior mines by one year. The ores of Australian mines are principally sulphides, though rich carbonates are found at the Blinman mine and elsewhere, while native copper occurs at many points. The copper production of the commonwealth of Australia comes mainly from Tasmania, New South Wales and South Australia following, with 18 or 20 per cent. of the total product each, and Western Australia and Queensland bringing up the rear. More detailed references to the various states of the commonwealth are given under the titles of each, in the following brief articles.

NEW SOUTH WALES. The Great Cobar mine was opened in 1869, and was the first real copper mine of the state, though attempts at copper mining were made as early as 1847. A considerable number of copper mines, mostly shallow and with small development, have been opened at various points, from time to time. The Cobar district, in the western part of the state, is much the most important, and the Great Cobar mine produces the bulk of the copper output. The country rock of this district is mainly slates of the Silurian system, with few eruptive rocks—a rather unusual home for copper. There is also a cupriferous district in the central part of the state, where eruptive rocks predominate, and there are a number of scattering mines along the coast.

QUEENSLAND. This state was at one time a regular copper producer in a small way, but the industry fell upon evil times when the price of copper went down in 1889, after which copper production and development were at a low ebb until about 1898, when there was a great revival. The older copper fields were at Peak Downs, Cloncurry and Mt. Perry. At Peak Downs native copper was mined from amygdaloid trap, under conditions greatly resembling those governing in the Lake Superior copper district. Lack of transportation facilities caused the suspension of work. The Australian

Copper Company was once a considerable producer from the Cloncurry district, but high transportation charges caused the abandonment of that field also.

In the Mt. Perry district there is considerable activity, several strong mining companies being now at work. The Queensland railroad affords good transport, and there are smelters at the mines. The country rock is granite, and the veins are mineralized only for a portion of their width, the rich zones of mineralization rarely averaging a foot in width. Ore values have disappeared with depth in some cases, but in one instance remain unimpaired to a depth of 800 feet. The ores are highly silicious, but it is proposed using the auriferous and argentiferous gossan for a flux, which should kill two birds with one stone.

The Chillagoe district of the Herberton field has ores in carboniferous limestone, the geological conditions being comparable with those of certain Arizona districts. The existence of ore deposits without regular walls, forming a stockwerk, is a typical feature of this district. Development has been hampered by lack of adequate transportation facilities, but this will be remedied by the completion of the Chillagoe railroad, an ambitious undertaking designed to aid in the development of the mineral wealth of a large part of Queensland hitherto inaccessible. A big water power at Barron Falls is available for use at the Chillagoe mines.

There is also considerable activity in the Mt. Garnet district, though something of a chill has been caused by the drop in the price of copper in 1901. A number of small mines have been opened in the Stanthorpe district. These are said to be of promise. Undeveloped copper deposits are also known to exist in the neighborhood of Rockhampton and Gladstone, at Ravenswood, near Cardwell and to the west of Townsville, also, at other points on the eastern watershed.

SOUTH AUSTRALIA. The Kapunda mine was first opened in 1842, a decade before the discovery of gold, and in 1845 the Burra Burra began production. Since that time South Australia has been a regular though not altogether steady producer of copper, and it seems probable that the present annual output of five to six thousand tons is far less than this state is capable of producing. The Moonta was opened in 1863 and later consolidated with the Wallaroo, 10 miles distant. This consolidated property is now the chief producer of South Australia. The first smelter was built at Port Adelaide in 1851, and the second at Wallaroo ten years later.

On the Yorke Peninsula, where the Wallaroo and Moonta mines are opened, the country rock is porphyry, and the ores are principally sulphides, with oxidized ores, including a considerable percentage of atacamite, in the upper parts. A barren zone of 50 to 125 feet lies between the oxidized ores and the unaltered sulphides, though the veins continue regularly, but are filled with gangue rock only.

In the Kapunda district, 50 miles north of Adelaide, where the first mining was done 60 years ago, the ores are oxides and carbonates, with some

native copper. In the Burra Burra district, about 100 miles northeast of Adelaide, the country rock is limestone and shale, with very irregular deposits of rich altered ores, more regularity in vein formation being noted at considerable depth. Many mines have been opened in South Australia during the past 60 years, but only a few of them have been developed in more than the most rudimentary manner.

VICTORIA. The existence of copper deposits at various points in Victoria has long been a matter of common knowledge, but for some reason no serious mining has been done. The most notable field is in the Beechworth district, where outcroppings of copper ore have been found at a number of points in an area of about fifty square miles.

WESTERN AUSTRALIA. This state is noted for its large and profitable gold mines, but copper mining is not in a very advanced stage, although the first mine was opened as long ago as 1855. The total production to date is slightly under 15,000 tons, and the current rate of production is less than 1,000 tons per year. The principal development is in the Mt. Malcolm district, where the ore is matted in water-jacket furnaces at the mines. In other districts the ore is hand-dressed for shipment to distant smelters, and of course only the richer altered ores can pay for hand-work and high carriage charges.

Other principal cupriferous districts of Western Australia are the West Pilbarra, Murchison, Northampton, Mt. Margaret, Phillips River, Ashburton and Champion Bay. In the West Pilbarra district the country rock is a schistose slate, the copper occurring in a compact intrusive rock of igneous origin. The ore, chiefly carbonates and oxides of high grade, is secured by quarrying. In the Northampton district, the cupriferous belt is said to reach from the Irwin river on the south to the Murchison river on the north, and to carry rich copper carbonates, as well as lead ores. The Ashburton is a new district, in which a number of leases have been granted, but development work is so slight that little seems known beyond the assured existence of copper ore. The Phillips River district carries silicious gold ores, and ferruginous copper ores, the latter apparently in considerable quantities. The ores are mainly malachite and chalcocite, and are of high value, average assays running 31.48 per cent. copper, 2.16 oz. silver, and 0.15 oz. gold per ton. Taken all in all, it may be said that while Western Australia has been but scratched for copper, the results indicate the existence of several districts of distinctly above the average promise. The drawbacks are scant water supply and lack of railroads, but these can be overcome by a judicious combination of capital, time and skill.

TASMANIA. The copper mining industry of this island has had a rapid growth. The Mt. Lyell mine began production in 1896, and a large number of new mines were projected in the immediate vicinity. The promoters of these properties displayed a most lamentable paucity of imagination, or else a strong desire to profit by the name of the first successful mine of the dis-

trict, and as a consequence practically all of the actual and projected copper mines of Tasmania are Lyells of some degree, at least in name.

There is a little native copper in Tasmania, and a limited amount of chalcocite, but the deposits are mainly low-grade chalcopyrite, with a little bornite. The ore bodies occur as mixed iron-copper sulphides, in enormous bodies, in conglomerate and quartzite, the country rock being a micaceous schist. The principal mines are the Mt. Lyell and North Mt. Lyell, two properties that should be one, as each is the natural complement of the other, and both could be best worked as one, the Mt. Lyell ore being low in copper but rich in sulphur, while the North Mt. Lyell ores are of high grade but illy adapted for smelting without a flux of just the sort found in the chalcopyrite of the Mt. Lyell. The Mt. Lyell Blocks is notable for its present attempt to develop a native copper mine, the prospects of which are said to be good.

The Tasmanian copper fields are among the most important opened within the two past decades and give promise of large production in the future. So far development is confined almost exclusively to the Mt. Lyell district, but a little exploring is being done in the Mt. Jukes and Darwin fields. Tasmanian production (exports only) was 11,221 tons of ore and 9,981 tons of blister copper running better than 99 per cent. in the year 1901.

NEW ZEALAND. Copper mines were opened and worked on Great Barrier Island and on Kawau Island, New Zealand, circa 1865, but the mines were closed when the price of copper fell. There has recently been some talk of reopening the Kawau Island mine. A mine was also opened at Nelson, circa 1880, on a sulphide ore vein, by Melbourne people. This mine had a smelter, and it has recently been proposed to reopen the property. Ore has also been found at Omaunū, Whangaro county. A little copper ore is dug and exported every year, the production amounting to but 12 tons of ore in 1900.

BORNEO. The existence of copper, gold, coal and other minerals has been noted in the northern part of the island of Borneo.

JAVA. This island is the source of a small annual supply of copper, obtained under the most unique conditions. In the Gunong Kendeng district there are springs containing iodides in solution, and from these thermal waters crude iodide of copper is secured by evaporation, the production amounting to 2,346 kilograms in 1899. It is probable that deposits of copper ore exist in the interior of the island, but definite data is lacking on this point.

NEW CALEDONIA. Copper has been mined to some extent in the northern part of this island, the ore occurring as chalcopyrite in lenticular masses in talcose and chloritic schists, these being said to contain an average of 16 per cent. copper. Silver is found in association with the copper in most cases, and New Caledonia is, next to Canada, the most important source of nickel supply at the present time.

SOLOMON ISLANDS. Copper ore has been found in the British Protectorate of the Solomon Islands, but details are lacking.

PHILIPPINES. Copper has been mined and smelted in a crude way in these islands since the Eighteenth century. In a typical native reduction plant the ore, after being hand-mined, is cobbled to medium size, then broken to small lumps on anvils, after which it is reduced to still finer size by passing through trains of rolls, usually of iron, but sometimes of stone. The ore is then smelted in crude furnaces and brought to metallic form by successive manipulations. Naturally, the production is small, and is all taken for domestic uses. There are no figures of output available. There are copper and gold mines at Mancayan and Suyoc, province of Lepanto, Island of Luzon, also at other points on this island, the copper ores of Luzon being auriferous as a rule. There are also deposits of copper ore, from which a little metal is extracted occasionally, in the islands of Benguet, Negros, Panay and Mindanao, and also, it is believed, in the little-known island of Sulu.

CHAPTER XV.

COPPER MINES OF THE WORLD.

As in the three preceding annual editions of this work, the detailed descriptions of copper mines and companies, given in this chapter, are printed in alphabetical order, regardless of location. This plan, while having some obvious disadvantages, is found, upon the whole, the best of any tried or suggested, as it renders the work fully self-indexing. In actual practice the plan is not so easy to enforce as might be assumed, owing to the large number of duplicate names, and for various other reasons. The definite articles have been omitted from all titles in English and German, but could not well be omitted from Spanish and French titles. In cases where the Spanish or French articles are used, the descriptions have been filed upon the name of the mine rather than the article, except that in the case of American or English companies having Spanish titles, the filing has been done upon the article, whether *La*, *Las*, *Los* or *El*. The plan of indexing followed may seem somewhat cumbersome and awkward, but the difficulties encountered in dealing with titles in a dozen different languages, each with its own individual idioms, have been by no means inconsiderable.

As in previous years, there is a very considerable increase in the number of titles, which have grown from 256, in Volume I, to about 5,000, in the present issue. It must not be thought, however, that the supply is nearing exhaustion. Chile alone has about 5,000 copper properties, mainly mere prospects, of very slight importance, only about 100 of which are included in the present edition.

AAMDAL COPPER MINES SYNDICATE, LTD.**NORWAY.**

Property sold and company wound up, circa 1903.

AAMDAL MINE.**NORWAY.**

An old property, at Mo, Rratsbergamt, Norway, which formerly was worked to a considerable extent. Was sold, circa 1903, to the Tharsis Sulphur & Copper Co., Ltd., by the Aamdal Copper Mines Syndicate, Ltd., and was resold, circa 1904, to a Norwegian syndicate. The mine made 240 tons of fine copper in 1895, when last worked as a producer. Development by the Tharsis company is said to have shown a large body of low-grade ore, and property is regarded as promising, if worked on a large scale, with a fully modern plant.

ABBEY MINING CO.

NEW MEXICO.

Office: 1007 Bessemer Bldg., Pittsburg, Pa. Mine office: Socorro, Socorro Co., N. M. Nelson Weddle, Jr., president; Earl A. Wheeler, vice-president; H. A. Spangler, treasurer; J. F. Hinckley, secretary; Nathan Hall, general manager. Organized December, 1901, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par; issued, \$800,000.

Lands, 19 claims, area 380 acres. The original group of 12 claims, known as the Abbey, is 22 miles north of Magdalena, Socorro county, showing two parallel veins, with about 600' of development work, now idle because of heavy inflow of water at depth of 100', carrying ores assaying up to 40% copper and 80 oz. silver per ton. The Washington group, of 7 claims, 10 miles west of Upham, has a 165' shaft. Idle.

ABBOT CREEK GOLD & COPPER MINING CO.

NORTH CAROLINA.

Office: care of W. J. Brent, Portsmouth, Va. Lands are in Lexington county, North Carolina. Main shaft, 80', is in a vein giving average assay values of \$15 per ton, in copper and gold. Has a concentrator and mill with Treiman stamps and crusher.

ABERDEEN COPPER CO.

NEW MEXICO.

Dead. Died the death of a bankrupt, in great agony. Fully described in Vols. IV and V.

ACARI COPPER MINING SYNDICATE, LTD.

PERÚ.

Has idle mines in the Acari district of the province of Camafia, Perú.

ACCIDENTAL MINING & MILLING CO.

COLORADO.

Mine office: Granite, Chaffee Co., Colo. C. Tyron, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has steam power.

ACME CONSOLIDATED GOLD & COPPER MINING CO.

WYOMING.

Office: 7 Congress St., Boston, Mass. Mine office: Laramie, Albany Co., Wyo. Isaac Van Horn, president; Arthur S. Howe, secretary and treasurer; Fred A. Miller, general manager. Organized May 16, 1905, under laws of Maine, with capitalization \$1,000,000, shares \$1 par. Annual meeting, second Thursday in July. Lands, 16 claims, 12 patented, also a 60-acre millsite. Is a securities-holding corporation, controlling, through stock ownership, the Acme Gold & Copper Mining Co., also about one hundred million feet of standing timber, a sawmill, planing-mill and lumber yard at Centennial, Wyoming, an office building at Laramie, and 1,800 city lots at Laramie, the townsite of Centennial, the Centennial Post newspaper, and 320 acres of lands that are being improved for the Rocky Mountain Country Club, at Centennial.

ACME GOLD & COPPER MINING CO.

WYOMING.

Control owned by Acme Consolidated Gold & Copper Mining Co.

ADA B. GROUP.

BRITISH COLUMBIA.

At Princeton, Yale District, B. C. W. as under bond to the Granby company in 1904, but was not purchased. Is claimed to show a mineralized formation 60' wide, traceable 700'.

ADA COPPER MINING CO.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. H. L. Frank, president; Jas. B. White, manager. Organized 1904, under laws of Montana. Property is the Ada mine and sundry adjoining claims, carrying gold, silver and copper. Management planned, April, 1906, to resume work.

ADAKAI MINE.**JAPAN.**

Mine office: Adakai-mura, Yatsuka-gori, Izumo, Japan. Country rocks are Tertiary shale and sandstone, alternating. Principal vein strikes NNE. Ores are bornite, chalcopyrite and pyrrhotite, accompanied by native copper and sphalerite, with clay gouge.

ADAMS COPPER CO.**WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. W. S. Adams, superintendent, at last accounts. Presumably idle.

ADAMS COPPER MINING & REFINING CO.**COLORADO.**

Office: 513 Cooper Blk., Denver, Colo. Capitalization \$800,000, shares \$1 par. Lands, 7 claims, in Larimer county, Colorado. The Copper Coin claim has a 200' shaft, with steam plant, showing about 4' of copper ore, said to assay \$47.50 per ton on the 200' level.

ADDIE COPPER MINING CO.

Letter returned unclaimed from former office, Denver, Colo.

ADELAIDE STAR MINES, LTD.**NEVADA.**

Offices: 33, Renfield St., Glasgow, Scotland. Mine office: Golconda, Humboldt Co., Nev. P. Coats, chairman; D. M. Boyd, secretary; Glasgow & Western Exploration Co., Ltd., general managers; Otto Stallman, superintendent; J. Farren, mine superintendent. Capitalization £350,000, shares £1 par. Lands, 319 acres, including the Adelaide mine in the Humboldt district, and the Star mine in White Pine county, also a 170-acre millsite. Owns a 12-mile railroad from mines to Golconda. Ores carry copper, gold and silver. Has steam power and a reduction plant at Golconda that is said to have cost about \$200,000. Is developing the Star mine, on a small scale.

ADIRONDACK MINE.**MONTANA.**

Owned by North Butte Mining Co.

ADMIRAL GOLD AND COPPER MINING CO.**NEW MEXICO.**

Office: Sterling, Kansas. Mine office: Tusas, Rio Arriba Co., N. M. C. A. Cooper, president; W. M. Bisbee, secretary; Jos. Ratliff, superintendent. Organized 1900, under laws of New Mexico, with capitalization \$500,000, shares \$1 par. Lands, 5 claims, area 120 acres, in the Bromide district, showing 3 fissure veins of 10' average width, carrying sulphide ores, opened by 3 shafts, deepest 130'. Idle at last accounts.

ADMIRAL MINE.**WYOMING.**

Supposedly located in vicinity of Encampment, Carbon Co., Wyo.

ADVANCE DEVELOPMENT & MINING CO.**ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Alex. Erickson, superintendent; Parker L. Woodman, president. Organized 1906, under laws of Arizona,

with capitalization \$1,000,000, shares \$2.50 par. Lands, sundry claims 3 miles from Bisbee, opened by a 30' shaft, showing ore assaying well in gold and copper. Officers of company enjoy a good local standing.

ADVENTURE CONSOLIDATED COPPER CO.

MICHIGAN.

Office: 32 Broadway, New York. Mine office: Greenland, Ontonagon Co., Mich. Isaac H. Meserve, president; James L. Bishop, vice-president; W. R. Todd, secretary and treasurer; preceding officers, Chas. J. Devereaux, James S. Dunstan, Chester E. Weston and Chas. D. Hanchette, directors; W. A. O. Paul, assistant secretary and treasurer; Samuel Brady, superintendent; W. H. Williams, mining captain; Allan M. Eddyvean, mill superintendent; A. H. Sawyer, engineer; S. A. Prince, clerk.

Organized Oct. 17, 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; paid in, \$20. American Loan & Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent. Calls on capital stock have been as follows: \$5 on organization; \$3, June, 1900; \$6, June, 1901; \$2, October, 1902; \$2, June, 1903; \$1, September, 1904; \$1, January, 1905.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,850,000.00
Amount paid in by conveyance of property.....	250,000.00
Entire amount invested in real estate.....	250,000.00
Amount of personal estate.....	87,203.94
Amount of floating debt.....	50,127.25
Amount due company.....	49,479.72

Lands include the old Adventure and Hilton tracts, in one body to the eastward, and the Knowlton tract, lying a mile southwest, with total area of 1,696.22 acres on the mineral belt, also a millsite on Lake Superior. The mineral lands are located in Sections 35 and 36, Town 51 North, Range 38 West, and in Sections 1 and 2, Town 50 North, Range 39 West. The Toltec and part of the Belt lie on the North, Aztec on the east, Toltec and Mass on the south, and the Mass on the west of the main tract. The Knowlton tract has the Mass to the north and east, Flint Steel to the south and Michigan to the west, the Ridge mine of the Mass lying between the two Adventure tracts. The village of Greenland lies on the northwestern corner of the Adventure's principal tract, and the village of Maple Grove, controlled by the company, is near the mine.

The old Adventure mine was opened in 1850, along a line of ancient pits showing prehistoric mining. The largest annual production was 116 tons, 1,941 lbs. fine copper, in 1857. After closed by the owners, the old openings were worked for years by tributors, with good results, being notably rich in silver.

The Hilton, or Ohio mine, opened in 1863, on the Mass lode, never was worked vigorously. The Knowlton was opened in 1853. These three old mines made 974 tons, 1,173 lbs. fine copper, previous to their merging

as the Adventure Consolidated. Work was started Nov. 1, 1898, by the present company.

The Adventure has a series of 7 parallel copper-bearing beds in a cross-section of about 1,200' and these, coupled with the existence of Adventure Bluff, a 300' hill, have caused the opening of the mine by adits as well as by shafts. The "South Range," or "Evergreen Belt" of Ontonagon county, comprises a belt of bedded traps, amygdaloids and conglomerates, 7 of these amygdaloids carrying copper on the Adventure tract. These lodes, from north to south, are as follows:

(1.) Knowlton. This is the bed on which the shafts of the mine are opened, and apparently is the richest, ranging 4' to 28' in width, with an average of about 10'. It carries epidote, chlorite, prehnite, and the minerals commonly found associated with these in the Keweenaw series. A considerable part of the product is heavy copper.

(2.) Merchants. Underlies the Knowlton bed at a distance of 20' to 65', and averages about 10' width. Is a stamp lode, but has produced masses up to 500 pounds weight, and is opened by crosscuts, with considerable drifting.

(3.) Mass. A continuation of the same lode found at the Ridge mine of the Mass Consolidated. Averages 10' width and lies 100' south of the Merchants. Carries no heavy copper and but little stamp-rock. In the Hilton, to the east, the Mass lode shows good rock, as it does also in the Knowlton mine, to the southwest.

(4.) North Butler. Lies nearly 100' south of the Mass, and carries some copper, but has not been tested extensively.

(5.) Butler, or Champion. Is the most vigorous amygdaloid in the property, ranging 12' to 50' in width, with an average of about 20', and lies nearly 200' south of the North Butler. Ranges in value from very rich to absolutely worthless, carrying masses to a considerable extent, and always has been noted for its richness in silver, but in proportion to its great width gives but a small amount of stamp-rock, though fine stopes are opened occasionally. This bed apparently has a felsite base, and chemically and mineralogically differs from the parallel strata on either side. A large amount of opening work has been done on this lode, and the Butler, next to the Knowlton, has the most development and gives the best showing of any of the seven parallel beds of the mine.

(6.) Ogima. Lies about 100' south of the Butler, and has been but little opened on the Adventure, but shows some good stamp-rock in places, but is bunched.

(7.) Evergreen. Lies about 250' south of the footwall of the Ogima, and averages about 10' width. Has produced considerable copper at adjoining mines. The Evergreen has been tapped by a crosscut from the sixth level of No. 3 shaft, showing encouraging copper ground. The Evergreen is the best lode of the Mass mine, but has been given little attention at the Adventure.

The cupriferous lodes of the Evergreen belt are notoriously bunched,

being rich in spots and worthless at other points. The strike of the parallel lodes of the Adventure is N. 73° E. on the main tract, where operations are now in progress, and the shafts are sunk at an angle of 45°. There are 4 tunnels and 4 shafts, latter, except No. 1, in the Merchant lode, being sunk on the Knowlton bed, at 45°, and numbered from west to east.

No. 1 shaft has three compartments, 7x18' inside of timbers, and is 1,180' deep. Surface equipment includes a 38x59' steel boiler-house with three 500-h. p. Burt boilers; a 59x59' steel engine-house having an Allis-Chalmers double-cone duplex direct-acting hoist with 42x60" cylinders, capable of raising a 12-ton load from a depth of 5,000' on an incline of 45° at a speed of 2,000' per minute, and a 38x65' steel compressor-house, with a 60-drill Rand-Corliss air-compressor of high efficiency. No. 1 shafthouse and rockhouse are separate buildings, 200' apart.

No. 2 is a 2-compartment shaft, 6x12' inside of timbers, and was discontinued at depth of 190' and hoist removed.

No. 3 is a 3-compartment shaft, 7x18' inside of timbers, 865' deep, with a 42x84' combination steel shaft-rockhouse 116' high. The 59x59' engine-house is of wood, with a duplicate of the hoist at No. 1. This is the principal shaft of the mine, and the east drifts toward No. 4, are showing well in the lower levels.

No. 4 shaft, 2,200' east of No. 3, was started Sept 1, 1905, and was 187' deep at end of the year. This shaft also is on the Knowlton bed, and shows a lode of 8' at the ledge, widening to about 16' at the bottom, and gives an encouraging showing of copper. A temporary shaft-rockhouse has been built, and rail connections were supplied in the spring of 1906, and it is hoped that No. 4 may become an important producer by 1907.

No. 5 is merely a tentative site for a shaft, about 1,000' east of No. 4, marked by a trench across the Knowlton lode, which shows rather encouraging rock at that point. The principal promise of the mine is on the Knowlton lode, in the eastern part of the mine. The parallel lodes have been prospected to a slight extent by crosscuts, driven south from shafts 1 and 2. The mine was working 33 power drills at the close of 1905.

Water for boilers is taken from a stream dammed near No. 1 shaft. The mine has a complete electric light and power plant, and an electric haulage plant in the Butler tunnel. The principal mine buildings are sheathed with steel and painted, and the mine location is exceptionally attractive. Protection from fire is secured by water mains, fed from a reservoir on Adventure Bluff. The mine is served by a spur of the Copper Range Railroad.

The stampmill, at Edgemere, on Lake Superior, went into commission Sept. 22, 1902. The mill, built and equipped by the Allis-Chalmers Co., is 135x217', of steel on stone foundations, with a 69x72' boiler-house and 32x72' pump-house. Equipment includes 3 Allis-Chalmers heads, fitted with Farnall-Krause mortars having 11-16" openings in discharge screens, with two horizontal revolving screens having 5-16" openings for each head. The stamp pistons are automatically rotated, equalizing wear on the shoes. From the revolving screens of the heads the crushed rock goes to the separator jigs, 24

for each head, or 72 for the mill, thence to 36 finisher jigs. There are round slime-tables, 3 Overstrom and 3 Wilfley concentrators, and Huntington mills for the raggings. The rock-bins have a storage capacity of 4,500 tons. Coal is delivered from trestles to boiler-rooms by gravity, through chutes. The pump is a 16,000,000-gallon Riedler, drawing its supply from Lake Superior through a tunnel extending 1,200' under the lake. Miscellaneous improvements at the millsite include an office, smithy, machine-shop, dwellings, etc. There is 8' to 12' of clear water off-shore, permitting the landing of cargoes from scows, in good weather.

The fortunes of the Adventure were at a very low ebb when the management of the mine was taken by Mr. Brady, on April 1, 1904. In fact the management took a referendum vote of shareholders to decide whether a dollar assessment should be levied, or the sponge thrown up for good. High-water mark in production was reached June, 1903, with an output of 155 tons of mineral, after which production declined steadily until it reached 63 tons in April, 1904. The decrease was due to lack of stoping ground. Under Mr. Brady's careful management production has been increased slowly, and reached 144 tons in January, 1906. At the same time reserve stopes have been increased and the general underground position greatly strengthened.

In the calendar year 1903, the Adventure made 2,182,608 lbs. fine copper, and expended \$140,982.42 more than its earnings. In 1904 the production was 1,380,480 lbs. fine copper and outgo exceeded income by \$92,032.08. In 1905 the output of fine copper was 1,606,208 lbs., and balance of expenditures over earnings was \$88,651.00, this including \$14,195.47 for construction account. On the face of matters, the showing is not very encouraging, but inspection of the work under way gives a more hopeful appearance to the case. The mine's monthly product is growing slowly, reserve stopes are being increased, and better ground is being opened in the eastern part of the mine. There is not, in Lake Superior, a more capable and upright mine manager than Mr. Brady. He was called into the case as a last attempt to save the patient's life, when an autopsy seemed the next step in the proceedings. He has done very well indeed, in the face of great difficulties, and if the Adventure can be made a paying mine, Mr. Brady will make it such. The shareholders should remember that Mr. Brady, beyond question, saved the life of the mine in 1904, and they should give him a chance to put the property on its feet—a process that will require time and money.

AETNA GOLD & COPPER MINING CO.

UTAH.

Formerly operated at Bingham Canyon, Salt Lake Co., Utah.

AETNA MINE.

MICHIGAN.

Sold, 1905, to Keweenaw Copper Co.

AETNA MINING CO.

COLORADO.

Letter returned unclaimed from former mine office, Bonanza, Colo.

AETNA MINING CO.

WYOMING.

Office: care of R. H. Fehland, president, Merrill, Wis. Mine office: Riverside, Carbon Co., Wyo. Julius Thielman, secretary; Roger Daniels, superintendent. Organized under laws of Wyoming, with capitalization \$1,000,000,

shares \$1 par. Lands, 7 claims, area 140 acres, in the vicinity of Beaver Creek, circa 12 miles south of Encampment, showing 4 veins of 3' to 6' width, as fissures and as contact veins between granite and quartzite, carrying chalcopryrite, bornite and chalcocite, estimated to average 25% copper, and developed by a shaft of 200' and tunnels of 125' and 380'. Has a 40-h. p. steam plant.

AFORTUNADA COPPER MINES, LTD.**SPAIN.**

Title changed, 1903 to Rio Rimal Copper Co., Ltd.

AFRICAN & AUSTRALIAN CO., LTD.**AUSTRALIA.**

Offices: Broad Street House, London, E. C., Eng. J. B. Palmer, chairman; H. J. Dixon, secretary. Organized April 7, 1902, as a third reconstruction of the West Australian Mining Co. and Victoria Copper Co., with capitalization £120,000, shares 2s. par. Holds stock interests in the Copper Selection Syndicate, Ltd., and various other enterprises.

AFRICAN NOBLE DUKE GOLD & COPPER MINING CO.**ARIZONA.**

Office and mine: P. O. Box 1351, Bisbee, Cochise Co., Ariz. George W. Vandermark, president; Joseph Hughes, vice-president. Company does not pay its debts and apparently is moribund.

AFTERTHOUGHT MINING CO.**CALIFORNIA.**

Dead: Lands sold to Great Western Gold Co.

AFTON MINING & SMELTING CO.**MONTANA.**

Letter returned unclaimed from former office, Helena, Mont. Described in Vol. V.

AGASSIZ MINING CO.**ARIZONA.**

Office: 92 State St., Boston, Mass. Letter returned unclaimed from former mine office, Ray, Pinal Co., Ariz. Organized 1900, with capitalization \$1,250,000, shares \$1 par. Lands, 17 claims, also 40 acres of placer gold property, on the Gila River, near Ray. Idle and apparently moribund.

AGATE HARBOR MINE.**MICHIGAN.**

Office: care of Mrs. Anna Scott Block, owner, 100 Washington St., Chicago, Ills. Lands, in Keweenaw county, Michigan, have been slightly prospected, but property never was a producer.

GEWERKSCHAFT AGNESENHÜTTE.**GERMANY.**

Has sundry mines of iron and copper pyrites in Hessen-Nassau, Germany.

AGORDO MINE.**ITALY.**

A small copper mine in the province of Venetia, Italy.

MINA AGUA BLANCA.**MEXICO.**

Is controlled by the Dwight Furness Co. A partly developed property, about ten hours' ride (horseback), northwest of Autlán, Jalisco, Mexico. Property considered promising.

AGUASCALIENTES METAL CO.**MEXICO.**

Office and mine: Asientos, Aguascalientes, Mex. Employs 600 men. Dr. Chas. L. Bennett, president; Kuno Doerr, vice-president; Victor Hunton, secretary; Albert Doerr, general manager. Organized Dec. 31, 1900, under laws of Mexico, with capitalization \$35,000, Mexican, shares \$500 par. Is operated as a close corporation. On Dec. 31, 1905, had quick assets of \$150,000, including \$50,000 cash, Mexican, and was without accrued liabilities. Lands,

82 pertenencias, area circa 200 acres, in the Asientos and Tepezalá districts, showing 5 ore bodies, of which 4 are being developed, these having average widths of 5', traceable 1,000', and carrying average values of 3% to 7% copper, 10 oz. silver and 0.1 oz. gold per ton, in oxide, carbonate and sulphide ores. The Merced-Orito mine, 8 kilometers west of Cobre station, on the Mexican Union Railway, has shafts of 250' and 300' and the San Simon y Anexas have tunnels of 100 and of 125 meters length. Mine has about 2 miles of underground openings. Has a 110-h. p. De Laval steam turbine dynamo, hoist and Cameron electric triplex pump, at the Merced-Orito. Has electric hoists of 20-h. p. and of 50-h. p., good respectively for 1,000' and 3,000' depth, with a good power-house and other necessary mine buildings. The Mexican Central railroad reaches the mines. Output averages 1,250 tons of ore monthly and is sold to the Aguascalientes works of the American Smelting & Refining Co. Production, 1905, was about 1,250,000 lbs. fine copper, 125,000 oz. silver and 1,800 oz. gold. Estimated output of fine copper for 1906 is 1,750,000 lbs. Management is good, and the property is considered to be of much more than average promise.

MINA AGUILA.**MEXICO.**

In the Sierra Ponces, Chihuahua, Mexico. White & Duran, operators, at last accounts. Has argentiferous copper ore.

AHMEEK MINING CO.**MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Kearsarge, Keweenaw Co., Mich. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; W. J. Ladd, secretary and treasurer; Wm. J. U'ren, general superintendent; Russell Smith, surface superintendent; Thomas Rapson, chief mining captain; Chas. D. Hohl, engineer; John T. Reeder, chief clerk and purchasing agent; Wm. Veale, clerk; H. B. Clausen, superintendent motive power. Organized 1880, under laws of Michigan, with capitalization \$1,250,000, shares \$25 par; \$17 paid in. Last call on capital stock was \$5, February 5, 1905.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$350,000.00
Amount paid in by conveyance of property.....	500,000.00
Entire amount invested in real estate.....	499,000.00
Amount of personal estate.....	186,640.18
Amount of floating debt.....	19,588.10

Lands, 920 acres, lying west and south of the Mohawk. Was set off in 1880, by the Seneca Mining Co., to work the Kearsarge, or Houghton, conglomerate, and under the management of Capt. John Daniell sunk 2 shafts in this bed, which averages about 70' width, with 3 paystreaks, of 2' to 3' width each, aggregating 7' width, each carrying copper in good quantities, but not payable, owing to great width of partially or wholly barren rock. Resumed work December 2, 1902, and exchanged 11.188 acres with the Algonas, in July, 1903, for an equal area, this giving each property a better arrangement of lands for development. The Kearsarge lode was located by

diamond drill in the spring of 1903, and immediately opened by a 137' cross-cut sent from the bottom of an old 100' vertical shaft. The bed was found both wide and strong, carrying a high grade of stamp-rock and heavy copper, fully equal in appearance to almost any other opening on the great Kearsarge lode. The crosscut also showed finely disseminated copper in the foot-wall for 20' before reaching the lode. Drifting was begun when the lode was reached, and an incline shaft, known as No. 1, was holed through to the surface by an upraise from below.

The mine is opened by two shafts, 1,445' apart. Owing to the peculiar configuration of the Ahmeek tract, there is no room for additional shafts. No. 1 was 740' and No. 2 was 853' deep at the close of 1905. Ten power drills are in use, of which 6 are drifting, 1 sinking, and 3 stopping. More could be used were there sufficient compressor capacity. The shafts are connected, as yet, on the first level only, but further connections will be secured during 1906. Drift-stopes are carried, permitting a considerable production, and the stopes opened are of good grade throughout. No. 1 shaft, which will be cut off by the side-lines of the Allouez, at a depth of slightly less than 3,000', apparently is the richer of the two. In sinking these shafts, concrete was substituted for wooden sleepers. Concrete ties were moulded in place upon the natural anchorage of rough rock, cores being left for rods to bolt the rails to the stringers. The concrete stringers are cheaper than those of wood, and presumably of longer life, though harder upon the rails and rolling-stock. Each shaft has two skips in operation. Each shaft is to have a shafthouse, with trolley to the centrally located rockhouse, adjoining the power plant. The rockhouse, of brick, is to have a cylindrical steel rock-bin, 32' in diameter and 45' high, with concrete foundation, and a tunnel with railroad track beneath, so that cars can be filled directly from the bin, by gravity alone.

The power plant, midway between the shafts, has a boiler-house of structural steel and a power-house of brick. The power-house is to have 2 double conical drum hoists, of one mile capacity each, and a high-duty air-compressor, latter under erection early in 1906. The power-house really is in three sections, with the boiler-house between, flanked on either hand by engine-house Nos. 1 and 2, for the respective shafts. The boiler-house has five boilers, with room for eight.

A complete geological cross-section of the Ahmeek tract was secured in 1904, by diamond drill borings. Production was begun April 21, 1904, at the Tamarack mill. One head at the Isle Royale mill was leased late in 1904. Rock is furnished from drift-stopes, carried 10' to 18' high, and the full width of the lode. In this way a considerable production is secured, going a long way toward paying for development. Production, 1905, was 1,552,957 lbs. fine copper. The Ahmeek is well managed, and is certain to make one of the best amygdaloid mines of the Lake Superior district.

COMPAGNIE DES MINES D'AIN-BARBAR.

ALGERIA.

Offices: 39, Rue Dulong, Paris, France. Mine, in the department of

Constantine, Algeria, shows several veins of chalcopyrite, assaying 8% to 15% copper, associated with sphalerite and galena. Idle since 1899.

AJAX GROUP.

BRITISH COLUMBIA.

On Valdes Island, Nanaimo district, B. C. A prospect, from which 30 tons of ore yielded 25% copper and \$6 gold and silver per ton. Idle for several years.

AJAX MINE.

MONTANA.

Mine office: Fox, Beaverhead Co., Mont. Noyes & Morse, owners; W. B. Stanchfield, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has steam power and a 5-stamp mill.

AJAX MINING CO.

UTAH.

Office: Salt Lake City, Utah. Thos. Weir, president and general manager; John M. Burt, secretary. Property is operated by lessees, under contract with management of the property. For the year ending Oct. 1, 1905, production was 5,077 tons of ore of all grades, carrying average values of 3.75% copper, 8.85 oz. silver and \$7 gold per ton. The first-class ore, 243 tons, carried upwards of 15% copper. Main shaft is 1,000' in depth, and the mine has considerable underground development. The company seems well handled and mine is regarded as promising.

AJO COPPER MOUNTAIN MINES CO.

ARIZONA.

Office: 237 Crossley Bldg., San Francisco, Cal. Mine office: Gila Bend, Maricopa Co., Ariz. Chas. Henderson, president; O. F. Melden, secretary; Anthony Bray, superintendent. Capitalization \$1,000,000, shares \$5 par. Holds the Ajo mines, including the Shotwell mine in the Ajo Basin, 120 miles south of Tucson and 170 miles southeast of Yuma, under bond and lease from Thos. Doak & Son, owners. Property includes antiguas, first opened 1763, and worked by Spaniards and Mexicans, which have produced considerable rich copper ore, including native copper, shipped to Swansea and San Francisco for reduction. The Shotwell mine has a 10-stamp mill and 2 Woodbury concentrators. Property is rich, but handicapped by lack of adequate transportation facilities.

AK-SAR-BEN COPPER CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. A. H. Crow, superintendent. Property has a strong gossan capping of hematite and limonite, and an 80' shaft, with small steam plant, and is worked intermittently, as the company can raise funds.

ALABASTER CAVE GROUP.

CALIFORNIA.

Office: care of Holmes Lime Co., owners, 22 Sacramento St., San Francisco, Cal. Lands, 180 acres, 7 miles east of Newcastle, Placer County California. Vein is traceable 6 miles, with strong gossan outcrop. Ore is said to average 4% copper, from paystreak of 3' to 8' in a contact vein 12' to 20' wide between limestone and slate. Idle.

ALACRAN MINE.

MEXICO.

Owned by Moctezuma-Arizpe Development Co., S. A.

ALADDIN MINING CO.

MONTANA.

Mine office: Clinton, Missoula Co., Mont. Idle for some years.

ALAMEDA MINING CO.**WYOMING.**

Office: care of P. J. Winters, manager, Encampment, Wyo. Mine office: Saratoga, Carbon Co., Wyo. Lands, three claims, near the Charter Oak property, opened by shallow shafts, deepest 30', and a 100' tunnel, said to show encouraging ore.

ALAMO COPPER CO.**ARIZONA.**

Said to have copper claims near Ajo, Arizona, but not found.

ALAMOS MINING CO.**MEXICO.**

Office: care L. C. Hanks, secretary and treasurer, Douglas, Ariz. Harry F. Smith, president. Organized February, 1906. Lands, sundry claims below Guaymas, in the Alamos district of Sonora, Mexico, slightly developed, said to show argentiferous copper ores. Company is said to plan erecting a smelter.

ALASKA AMALGAMATED COPPER CO.

Office: care of E. V. Dillman, Seattle, Wash. W. A. Mears, president. Organized 1906, with capitalization \$1,250,000. Lands, sundry claims on the Nazina river, an affluent of the Copper river, said to show ores ranging from 10% to 65% in copper tenor. Company expects to secure railroad connection in 1906, by a line building from Valdez to the Bonanza mines, which will permit the operation of central Alaskan copper mines, now handicapped by entire lack of modern transportation facilities.

ALASKA-CALUMET COPPER CO.**ALASKA.**

Office: 645 New York Bldg., Seattle, Wash. Mine office: Valdez, Alaska. Employs 4 men. H. M. Herrin, president; F. Freeman Evans, secretary; Walter Bowen, treasurer. Organized Jan. 13, 1906, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Lands, two groups of claims, area not given, adjoining the property of the Hubbard-Elliott, showing bornite assaying up to 56% copper and \$169 gold and silver per ton. Property will be served, eventually, by the Copper River & Northwestern, and Cordova Bay railroads, both under construction, early in 1906.

ALASKA COPPER CO.**ALASKA.**

Office: 316 Globe Bldg., Seattle, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. Henry W. Mellen, president and general manager; Frank T. Hunter, vice-president; Arthur S. Lovett, secretary; D. H. Roe, treasurer; Frank W. Hale, general manager; preceding officers, R. W. A. Simmons, C. E. Lovett, Henry Wellington Mack, Stewart H. Moore and H. T. Granger, directors; R. W. Gilson, superintendent; J. Cuthbert Welch, smelter superintendent; D. D. Stewart, mine superintendent. Organized Feb. 28, 1903, under laws of Washington, with capitalization \$5,000,000, shares \$25 par.

Lands, 18 patented claims, area 360 acres, also 18 patented millsites, area 80 acres, giving $1\frac{1}{4}$ miles frontage on Copper Harbor, a land-locked haven with deep water. Lands are on Copper Mountain, rising to a height of 3,600' directly from the harbor. Property is estimated to carry 20,000,000' of marketable timber, and actuates all machinery by waterpower, partially developed by a 22' steel pipe-line of 1,000' from Reynolds Creek to the

power plant, where there are 2 water-wheels of 300-h. p., total available power being estimated at 2,800 h. p.

Three veins are being developed, of which the Brooklyn, 10' to 30' wide, shows chalcopyrite assaying 3% to 34% copper. The New York vein is a contact between porphyry and limestone, 10' to 60' wide, and 500 tons of selected ore therefrom gave smelter returns of 16.9% to 29.06% copper. The principal vein is the Indiana, in limestone near a porphyry intrusion, with extreme width of 280', giving average assays of 5% copper and \$6 gold per ton. Mine has shafts of 40', 60', 90', 110', 230' and 230'. Principal development is by tunnels, permitting cheap extraction. Has 8 tunnels, of 70' to 2,900' length, with a total of 4,440' of underground openings, estimated to give 195,000 tons of ore blocked out for stoping. Ores are oxides and carbonates, with occasional native copper near surface, and sulphides at depth. Equipment includes a 500-h. p. water-power plant, with ten times as much available for future development. There is a sawmill on the property, of 15,000' daily capacity. Buildings include a 30x60' frame machine-shop, 20x70' frame carpenter-shop, 24x36' smithy, and various bunk-houses and other mine structures, with a total of 16 buildings, all of frame construction and substantially built.

A 1,400' ground-tram takes ore from the main mine opening, along the ridge of Copper Mountain, to the head of an aerial tram, whence it is carried to the smelter. The smelter has a 350-ton Allis-Chalmers blast-furnace, making matte carrying 50% copper, 7 oz. to 8 oz. silver and 1.6 oz. gold per ton, which is sent to Tacoma for refining. Some custom smelting is done for small adjoining mines. There were serious delays in blowing in the smelter, and trouble with leaks in the water-jacket and unsatisfactory settlers, after blown in, but production seems progressing more satisfactorily in 1906. The smelter is designed as the first half of a 700-ton unit.

The company owns a gasoline launch and has chartered a tug and barge. A general merchandise store is maintained. Ore smelted is said to be running better than 7%.

ALASKA COPPER & COAL CO.

ALASKA.

Office: 146-45 Broadway, New York. Name changed from Alaska Copper Co. to present title to avoid confusion with Judge Mellen's company, of the same name, at Coppermount. Henry O. Havemeyer, Jr., president; Ernest Truslow, secretary and treasurer. Organized under laws of West Virginia, with capitalization \$3,500,000, shares \$10 par. Property is known officially as the Kennicott group, but is more commonly known as the Bonanza group, located 150 miles by rail northeast of Valdez, Alaska. This property was claimed by the Copper River Mining Co., and also by the Chittwa Exploration Co., but patents to the 3,000 acres comprising the tract have been issued by the United States government to the Alaska Copper & Coal Co., whose title is perfect. At last accounts from Alaska, exploratory work was in progress and the property was guarded by armed men, acting under instructions to prevent all trespassing. Property is one of exceptional promise and bids fair to make a very large and rich mine. Management of the company is ex-

cellent. The Guggenheim interests apparently have become interested recently in the property.

ALASKA GOLD & COPPER CO.**ALASKA.**

Title changed to Central Alaska Gold & Copper Co.

ALASKA IMPERIAL MINING CO.**ALASKA.**

Offices: Helsingborg, Sweden, and Seattle, Wash. Mine offices: Coppermount, Prince of Wales Island, Alaska, and Ketchikan, Alaska. O. Gerle, president; Frank Kennedy, secretary. Capitalization \$2,000,000, shares \$100 par. Lands, sundry claims on Prince of Wales Island, carrying a contact vein between granite and limestone showing ores, associated with epidote and hematite, and carrying good gold values, similar to those of the Alaska Copper Co., which adjoins. Development is largely by surface trenching, with some tunneling and crosscutting. Also has lands on Dall Island, Long Island, Brafield Canal and Red Bluff Bay, in the Ketchikan district.

ALASKA IMPROVEMENT CO.**ALASKA.**

Mine office: Ketchikan, Alaska. Is said to have leased the property of the Grindall Mining & Smelting Co., on the Kasaan peninsula.

ALASKA INDUSTRIAL CO.**ALASKA.**

Office: 11 Broadway, New York. Mine office: Sulzer, Prince of Wales Island, Alaska. Employs 25 men. Hon. John P. Jones, president; Robert A. Lawrie, vice-president; Louis A. Sarecky, secretary; Alex M. Lowry, treasurer; Chas. A. Sulzer, general manager. Organized 1899, under laws of New Jersey, with capitalization \$1,000,000, shares \$1 par. Company has no liabilities. Annual meeting, second Monday in November.

Lands, 60 patented claims, area 1,200 acres, also a 60-acre millsite and an 80-acre townsite. Has 7 wide contact veins, between granite and limestone, said to give average assays of 6% copper, 3 oz. silver and \$3 gold per ton. Ores are mainly chalcopyrite, with some bornite, malachite and azurite and a little tetrahedrite. Development is by 4 shallow shafts, deepest 60', and by tunnels, of 30' to 225' length, giving 1,570' of mine openings, also 43 open-cuts, estimated to show 200,000 tons of ore, with 100,000 tons blocked out for stoping.

A water-power of about 5,000-h. p. is available on the property. Electric light is furnished by a 6-kw. generator, actuated by a 36" Pelton wheel. Improvements include 15 bunk-houses and cabins, a 35x70' general store, power-house, offices, etc. Company has a 47' gasoline launch for purposes of general utility, and has tide-water transportation at the mine. Material for a 2-mile aerial tram was partly delivered, early in 1906. A 200' wharf with 3,000-ton ore-bins is being built for ore shipments during 1906. Property is considered promising and management good.

ALASKA MINING CO.**UTAH.**

Mine office: Silver City, Juab Co., Utah. Presumably idle.

ALASKA SMELTING & REFINING CO.**ALASKA.**

Office: care of Samuel I. Silverman, general manager, Spokane, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. Is an auxiliary corporation of the Brown-Alaska company. Paul Johnson, smelter superin-

tendent. Has a small but complete smelting plant, erected 1903-1904, and plans doing a general custom smelting business.

ALAWERDI MINE.

RUSSIA.

Described under title Alverdski group.

ALBERNI GOLD & COPPER CO., LTD.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Alberni, Vancouver, Island, B. C. Property was the Thistle group, on Douglass Mountain, showing chalcopyrite assaying up to 1 oz. gold per ton.

ALBION COPPER MINING CO.

MONTANA.

Mine office: Sunday, Granite Co., Mont. Christian Reichert president; James M. Hinkle, secretary. Lands, opened by tunnels, show 3 veins, carrying concentrating ore with values in copper, lead, silver and gold.

ALBION MINING CO.

UTAH.

Office: care of Hatfield & Sons, Salt Lake City, Utah. Wm. Hatfield, general manager. Property is the Albion group, in Little Cottonwood Cation, Salt Lake county, which is said to have yielded about one million dollars worth of ore under former ownership. A tunnel of 2,800', being driven to drain old workings and open new ground, shows a fissure vein giving 15% copper ore, with silver values. Has water power.

ALDA COPPER MINES, LTD.

SPAIN.

Offices: Dashwood House, London, E. C., Eng. Mine office: Cabrales, Asturias, Spain. W. T. Rushton, secretary. Organized June 8, 1900, as a reconstruction of Alda Mining and Smelting Co., Ltd., with capitalization £130,000, shares £1 par. Debentures, £10,000 authorized, £8,050 issued, at 7%.

ALDA MINING & SMELTING CO., LTD.

SPAIN.

Reorganized, 1900, as Alda Copper Mines, Ltd.

SOCIÉTÉ MINIERE D'ALDEIRE.

SPAIN.

Mine office: Aldeire, Guadix, Granada, Spain. Presumably idle.

COMPANHIA MINEIRA ALEMTEJANA.

PORTUGAL.

Office: 4, Praça dos Remolares, Lisbon, Portugal. Mine office: Beja, Alemtejo, Portugal. Waldemar d'Orey, superintendent. Property is a group of old mines in the San Domingos district, showing two ore bodies occurring in schists, the selected product giving about 25% copper, from carbonate and sulphide ores. Mines were discovered and worked by the Romans.

ALESSANDRO COPPER MINING CO.

NEW MEXICO.

Office: 35 Union St., New Haven, Conn. Mine office: Silver City, Grant Co., N. M. Joseph C. Kelly, president; Edw. Parkhurst, secretary; Peter McQuaid, manager. Organized April, 1900, under laws of West Virginia, with capitalization \$500,000, shares \$1 par. Debentures, \$100,000 authorized, at 6%; issued, \$5,000. Lands, 50 claims, area 1,000 acres, also a 5-acre mill-site, in the White Signal, Burro and Anderson districts. Is developing 9 ore bodies, occurring as lenses or impregnations in the neighborhood of porphyry, these being claimed to give average assay values of 8% copper and 5 oz. to 40 oz. silver per ton, principally from carbonate and

sulphide ores. Has 9 shafts, from 40' to 225' in depth, also 9 tunnels, from 15' to 400' in length, with total underground openings of 1,300'. Has steam power, necessary mine buildings, 50-ton concentrator and leaching plant.

ALGOL MINE.**CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Opened circa 1865 and reopened 1899. Has a 50' vein, with 2" to 10" paystreak, opened by two shafts, each 120'. Ores are cuprite, malachite and azurite, also native copper and a little gold, giving average smelter returns of 20% copper. Has steam power. Presumably idle.

ALGOMA & CALUMET DEVELOPMENT CO.**ONTARIO.**

Dead. Lands transferred, June, 1903, to Hermine Mining Co., Ltd.

ALGOMA COMMERCIAL CO., LTD.**ONTARIO.**

Office: Sault Ste Marie, Ont. C. M. Boss, superintendent. Property includes the Elsie, Wilnot and other mines, 4 miles from Sudbury, Algoma, Ontario. Is closely allied with the Lake Superior Power Co.

ALGOMA COPPER & SMELTING CO.**ONTARIO.**

Office: care of Eugene Warner, vice-president, Prudential Bldg., Buffalo, N. Y. Mine office: Bruce Mine, Algoma, Ont. Mark B. Schwabe, president; Ben. Newman, secretary; Bernard J. Hillman, treasurer. Organized, circa 1905, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. Lands, 1,550 acres, circa 9 miles from Bruce Mine, opened by a 425' shaft and a 175' tunnel. Has a 300-ton concentrator. No recent developments, and company apparently inactive.

ALGONQUIN COPPER CO.**WYOMING.**

Office: 177 Broadway, New York. Henry H. Adams, secretary. Organized under laws of Wyoming, with capitalization \$1,000,000.

MINA EL ALICANTE.**MEXICO.**

Mine office: Mazapil, Zacatecas, Mex. M. Dolores Aguirre y Ca., owners; Vicente Banavides, superintendent. Ores carry gold, silver, lead and copper. Employed about fifty men, at last accounts.

ALICANTE GROUP.**COLORADO.**

Letter returned unclaimed from former mine office, Wortman, Lake Co., Colo. Property has ores carrying gold, silver, lead, copper and zinc, with steam power and a 35-ton concentrator.

ALICE GOLD MINING CO.**WASHINGTON.**

Office: 204 Empire State Bldg., Spokane, Wash. Mine office: Blue Creek, Stevens Co., Wash. J. F. Nylander, president; W. M. Higley, secretary and treasurer; Benj. F. Parker, general manager. Organized 1896, under laws of Washington, with capitalization \$150,000, shares 10 cents par. Lands, 11 claims, area 225 acres, in the Chewelah district, showing 4 fissure veins and lenses, latter of fair width and carrying sulphide ores giving good assay values in gold and copper, opened by two 200' shafts and 2 short tunnels. Presumably idle.

ALICE GOLD & SILVER MINING CO.**MONTANA.**

Property is controlled by Butte Coalition Mining Co.

MINA DE ALJUSTREL.**PORTUGAL.**

Mine office: Aljustrel, Portugal. Said to be owned by a Belgian company. Ore is chalcopryrite, associated with iron pyrites, carrying 1% to 7% copper. Mine is a small but steady producer.

ALLEGHENY MINING CO.**NEW JERSEY.**

Organized 1901, to work old copper mines in Pahaquarry township, near Delaware Water Gap, Warren County, New Jersey. Moribund.

ALLEN MINE.**OREGON.**

Office: care of Chas. d'Autremont, Jr., Duluth, Minn. Mine is located on the Rogue river, Oregon, and ores carry good values in gold and silver.

ALLENDE HERMANOS y CA.**SPAIN.**

Mine office: Elizondo, Navarra, Spain. Don Pedro Allende, superintendent.

ALLIANCE COPPER-GOLD CO.**BRITISH COLUMBIA.**

Mine office: Greenwood, Yale District, B. C. H. H. Shallenberger, superintendent. Shareholders supposed to be mainly residents of Minneapolis. Lands, sundry claims, including the Moreen, in the Deadwood camp, carrying low grade auriferous copper ores, developed by open-cuts.

ALLIANCE COPPER MINING CO.**WASHINGTON.**

Absorbed, 1902, by Iconoclast Consolidated Mines Co.

ALLIGATOR & TIGER LEASING CO.**COLORADO.**

Mine office: Red Cliff, Eagle Co., Colo. A. S. Little, manager. Lands 2 claims, showing massive bornite and chalcopryrite, in fissure veins, traversing granite, ores assaying up to 15% copper, 5% lead, 50 oz. silver and \$10 gold per ton.

ALLOUEZ MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Allouez, Keweenaw Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; preceding officers, Godfrey Morse, John C. Watson, Stephen R. Dow, Walter L. Frost, H. A. Tucker, and W. B. Mosman, directors. Organized 1859, reincorporated 1889, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; \$22.25 paid in. Last assessment, \$3 per share, levied 1904. Annual meeting, second Tuesday in March.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$2,214,672.50
Entire amount invested in real estate.....	130,103.39
Amount of personal estate.....	253,201.03
Amount of floating debt.....	8,464.50
Amount due company.....	1,218.75

Lands, circa 3,400 acres, including the tract of 640 acres on which the old and new Allouez mines are opened. The boundary line between the Allouez and Ahmeek was improved, 1903, by the mutual exchange of 11.188 acres.

The old mine, opened 1859, is on the Allouez conglomerate, a bed under-

lying the greenstone that is such a noticeable rock stratum in Keweenaw county. The conglomerate is 30' wide in many places, with strike of N. 39° E., and dip of 38°. Lode averages returns of 0.7% to 1% copper, and is very refractory under the stamps. There are 3 shafts, deepest about 3,700'. Mining was begun actively in 1869, and stopped in 1877, with an exhausted treasury. The mine was then leased to Watson & Walls, who made money from it, after paying a royalty of one-eighth on gross production. In 1880 the company resumed control, to quit once more, financially exhausted, in 1885. Watson & Walls took the mine again, and once more did well; the company resumed work on its own account for the third time, and again lost money, stopping all work in 1892. The old mine has been idle for some years, except for exploratory and development work in 1898-1900, when a shaft was sunk 1,200' on the Osceola lode, and nearly 4,000' of openings secured thereon, with indifferent results. The shafthouse at the Osceola shaft has been demolished. The stampmill, on Hills Creek, has three old-fashioned heads and cannot be used for the new mine. The old Allouez made 13,025 tons, 1,528 lbs. fine copper, 1869-1892.

A new mine is being opened on the Kearsarge amygdaloid bed, which does not outcrop on the Allouez tract, hence was opened, through necessity, on the underlay. This bed extends under the entire 640-acre tract. No. 1 shaft was started May 15, 1903, on the extreme southeastern corner of the tract, and Dec. 31, 1905, was 1,775' deep, cutting the lode at 1,480'. The first level is at 1,264' depth, reaching the lode by a crosscut sent east. This shaft leaves surface at 75°, but at little depth takes an angle of 80°, continuing until a depth of about 1,435', when a curve of 60' brings the shaft to an angle of 38° 30', to correspond with the lode at the third level. No. 1 shaft has 3 compartments. Owing to the exceeding steepness of the shaft, only 10° less than vertical, back-rails of 6x10" timber are set so close to the wheels of the skips that their flanges cannot leave the steel rails, the wooden timbers serving as guides. At the change of angle from 80° to about 38° 30' on reaching the lode, a single idler with a very wide flange cares for the cables passing at either end. In order to save pumping charges on surface-water entering the mine, a gutter has been cut entirely around the shaft, leading to an opening 36' long, half winze and half drift, used as a sump from which the water is forked. The shaft has a 42x62" steel shaft-rockhouse, with two 18x24" crushers.

No. 2 shaft is located 2,000' northeast of No. 1. Preliminary work was started late in 1904, but the country being very wet, it was necessary to sink drain shafts. The rock ledge was cut at 68' and a permanent No. 2 shaft started late in 1905 and work resumed thereon in the spring of 1906. No. 2 shaft is very solidly planned and started. The collar is of concrete, Washington fir and 16x24" steel "I" beams, with 14x14" square timber wall-plates and 4" plank sheathing. The interior, from collar to the ledge of solid rock, will be lined with a 22" thickness of concrete, and the dividers will have their ends bedded in concrete. This should give an absolutely impregnable shaft, through the treacherous sand overburden. No. 1 shaft also is very solidly framed and timbered, an average of about 60' of timber and lagging being used for each

foot of depth. Each shaft can be sunk about 9,500' before reaching the west boundary of the property.

The new mine has been found rich from the first opening, the lode averaging 16' to 18' width, and of the rock broken only 5% to 8% is being discarded. The openings on the various levels are carried as drift-stopes from wall to wall, and to an average height of about 12', the rock so broken furnishing the mine's production. Eighteen power-drills are in use, and, as depth is gained, openings are increasing rapidly in number and length.

The temporary hoist, good for a half mile depth, with which No. 1 shaft was sunk, has been removed to No. 2, and in June, 1905, a new hoist went into commission at No. 1. This is a Nordberg, with 32x72" duplex cylinders and 18' double conical drum. Foundations for necessary buildings were built at No. 1 shaft before permanent structures were begun.

The engine house is of mine-rock, with redstone trimmings. The stone boiler-house has five 125-h. p. boilers and a 120' self-supported steel smokestack. There are 12-drill and 18-drill air-compressors, and eventually a large compressor house will be built at No. 2 shaft. Miscellaneous buildings, completed 1905, include redstone machine and blacksmith shops and a large warehouse. All improvements are of the most substantial nature and a credit to the mine and its management. The mine is reached by a spur of the Mineral Range railroad.

Production was begun Aug. 1, 1905, at the Centennial mill, where one stamp has been leased for 3 years, at a charge of 40 cents per ton. Production for 1905 was 1,167,957 lbs. fine copper, secured from 41,120 tons of rock stamped, giving an average return of 28.4 lbs. copper per ton—placing the Allouez second only to the Wolverine in richness among the amygdaloid mines of the Lake Superior district. That this average is a fair one, the circumstances render assured, as the production came from drift-stopes, just as the mine was opened, and the broken rock discarded amounted to but 6.85%. There was no opportunity for "sweetening" the returns, even had such a thing been desired. Rock production, at the beginning of 1906, was about 10,000 tons monthly, foreshadowing an output of about 3,500,000 lbs. fine copper in 1906. The Allouez management succeeded, during the last 5 months of 1905, in making a unique record by earning a mining profit of \$54,660, and a net profit, over construction account and all other expenses of whatsoever nature, of \$19,143. The future of the Allouez is assured, and the mine, which is a credit to its management, will make another and very possibly a greater Wolverine.

ALMA COPPER MINING CO.

MEXICO.

Office: Des Moines, Ia. Mine office: Carbo, Ures, Sonora, Mex. Abner Graves, general manager; Nelson D. Graves, superintendent. Lands, 747 acres, in the Ures district, showing auriferous, argentiferous and somewhat bismuthiferous copper ores, in the forms of cuprite, melaconite, malachite, azurite and chrysocolla, assaying up to 37% copper and \$13 gold per ton. Has gasoline power.

ALMA GOLD MINING CO.**COLORADO.**

Office: Idaho Springs, Clear Creek Co., Colo. J. J. May, superintendent. Ores carry gold, silver and copper. Has steam power.

ALMA MINE.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Lardo, B. C.

ALMA MINING & MILLING CO.**MEXICO.**

Office: care of P. B. McCabe, Los Angeles, Cal. Letter returned from former mine office, Canitas, Zacatecas, Mex. C. A. Heberlein, general manager. Organized 1903. Lands include the San Antonio, San Luis, Torrington and Rosario mines, showing ores carrying 15 oz. to 150 oz. silver per ton, with appreciable copper values.

ALMADO & TIRITO CONSOLIDATED MINING CO.**MEXICO.**

Succeeded by Negociacion Minera de Clemente Ybarra.

SOCIEDAD MINERA DE ALMANZORA.**SPAIN.**

Office: care of Don Camilo Bilarge, agent, Javier Sanz, 4, Almeria, Spain. Property includes sundry copper mines in Almeria. Idle at last accounts.

ALMEDA MINING CO.**OREGON.**

Office 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. Employs 12 men. O. M. Crouch, president; R. C. Kinney, secretary and treasurer; John F. Wickham, general manager. Organized Sept. 17, 1900, under laws of Oregon, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, area 140 acres, also a 5-acre millsite and 30 acres miscellaneous lands, in the Galice district, showing a contact vein between porphyry and slate, said to be 107' wide and traceable 2,300', giving average assays of 3% copper and \$4.50 gold per ton, with traces of silver and lead, from chalcopyrite, developed by 8 tunnels, 2 longest 225' and 420'. Was originally worked to slight depth for free gold, circa 1860-1870. Mine shows a large deposit of base ore, with fair gold values and small silver values, and with large development and equipment should make a paying property.

ALMERIA QUICKSILVER & COPPER CO., LTD.**SPAIN.**

In voluntary liquidation, early in 1906.

ALMOLOYA MINING CO.**MEXICO.**

Office: 305 Trust Bldg., Los Angeles, Cal. Mine office: Baca, Ramal de Parral, Chih., Mex. Employs 180 men. Nils O. Bagge, president; I. B. Newton, secretary; W. C. Paterson, treasurer; D. W. Shanks, general manager; D. C. Joslyn, mine superintendent; Los Angeles Trust Co. and New York Trust Co., registrars. Organized 1903, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par, in \$800,000 preferred stock, at 10%, non-cumulative, and \$1,200,000 common stock: issued, \$1,400,000. Lands, 270 pertenencias, area 730 acres, also a 100-acre millsite, with total landed holdings of circa 1,000 acres, in the Allende district, about 4 miles from the railroad station at Baca. The Sierra de Almoloya is an isolated mountain range, about nine miles long, formation being limestone of Cretaceous age, with two eruptive intrusions. Property adjoins the well-known Cigarrero mine, which shows four ore bodies of good width. Devel-

opment is by shafts of 68', 140', 270', 350', and 540', and by tunnels of 180', 360', 1,320' and 1,600', with a total of about 6,400' of openings. In March, 1906, a 72' body of low-grade ore was encountered, this being a decomposed deposit, carrying bunches of copper and lead, with gangue of iron and manganese ores, and presumably is the top of a large deposit of ore of good grade. Property has gasoline, electric, and pneumatic power, with a 60-h. p. producer gas-plant for drills. Development to date has been conducted along sound lines, and property bids fair to develop a good mine, though this opinion is based more upon the probabilities of the situation than upon actual ore bodies opened to date.

ALPS MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

ALSACIA DEVELOPMENT CO.**MEXICO.**

Reorganized, 1905, as Alsacia Mining Co.

ALSACIA MINING CO.**MEXICO.**

Office: care of Chas. F. Wrenn, secretary and general manager, Bisbee, Ariz. R. L. Whaley, president; John Hermann, engineer. Lands are 23 miles east of La Cananea, in the Ajo Mountains, Arizona district, Sonora, Mexico, opened by a 400' shaft. Drifts on the 350' level show argentiferous copper ores giving average assay values of about \$25 per ton. Vein is said to be widening. Machinery includes a hoist good for 1,000'. A wrangle among the shareholders has been settled, and the management plans continuing development steadily.

ALTALTA MINING CO.**ARIZONA.**

Office: 145 La Salle St., Chicago, Ills. Mine office: Chloride, Mohave Co., Ariz. J. F. McBride, president; A. H. Dryden, superintendent. Ores carry gold, silver, lead and copper, precious metals predominating in value. Opened by shaft and has gasoline power. Employs 10 to 12 men, and management contemplates installation of a concentrating plant.

ALTA-IDAHO GOLD & COPPER MINING CO.**IDAHO.**

Office: care of John M. Nuss, secretary, Nescopek, Pa. Mine office: Pardee, Idaho Co., Idaho. Employs 12 men. J. B. Nuss, president; Geo. M. Snyder, vice-president and general manager. Organized December, 1902, under laws of Delaware, with capitalization \$1,000,000, shares \$1 par; issued, \$700,000. Lands, 11 claims, area 209 acres, also a 5-acre smelter-site, in the Lolo mining district. Development is by sundry test-pits, deepest 35', and three short tunnels, longest 210', showing melanconite, azurite, chalcocite, bornite and chalcopyrite. Company plans continuing development.

ALTA MINING & MILLING CO.**WYOMING.**

Office: care of P. E. Conley, secretary, 490 Quincy Bldg., Chicago, Ills. Property is the Rawhide Butte group, in the Rawhide Buttes of Wyoming.

ALTAMONT MINING CO.**NEW MEXICO.**

Office: care of Capt. L. H. Williams, president, Altamont, Ills. Mine office: Jarilla, Otero Co., N. M. Lands include the Cuprite property, developed by a 140' shaft, said to show 12' of medium grade chalcopyrite, with

limestone gangue. Sample shipments to El Paso smelter gave returns of \$10 to \$50 per ton.

ALTA-PERUVIAN MINING & MILLING CO.

UTAH.

Office: Springville, Utah. Mine office: Alta, Salt Lake Co., Utah. F. J. McAuliffe, president; T. R. Kelley, secretary and treasurer. Organized 1904 with capitalization \$200,000, shares \$1 par. Lands, 4 claims, in the Little Cottonwood district. Apparently no work is in progress.

ALTA QUINCY MINE.

UTAH.

Mine office: Alta, Salt Lake Co., Utah. Alexander Colbath, superintendent. Lands, sundry claims opposite the Columbus Consolidated, opened by a tunnel cutting a 25' fissure vein, with hanging wall paystreak averaging 11% copper, 10 oz. silver and \$2.80 gold per ton. Developments considered promising.

ALTA-ST. LOUIS MINE.

UTAH.

Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. W. M. J. Craig, manager. Has a vein between limestone and shale carrying a 12" to 18" paystreak, giving assays of 15% to 25% copper and 15 oz. to 240 oz. silver per ton, with small gold values.

KÖNIGLICHES HÜTTENAMT ALTENAU.

GERMANY.

Office and works: Altenau im Harz, Germany. Is a custom smelting plant, treating ores of copper and other metals from the mines of the Harz.

ALTENS KOBBERGRUBER.

NORWAY.

Office: care of Sulitelma Aktiebolag, Helsingborg, Sweden. Mine office: Kaafjord, Finnmarken, Norway. Emil Knudsen, chief director; Audr. Quale, general manager; B. C. G. Tiberg, engineer; Sverre Falch, chemist and mill superintendent; R. Rusten and Gustaf Swensson, mine superintendents. Is the northernmost copper mine of the world, being located near North Cape, in 70° north latitude. Lands, 90 claims, patented, area 93 acres, also a 60-acre millsite and 2,000 acres miscellaneous lands, in the Kaafjord district. Property shows about 30 fissure veins of copper and iron pyrites, 12 of which are more or less developed, these averaging 10' width and 3,000' length, carrying ores averaging about 2% copper. Has 6 shallow shafts and 8 tunnels, seven crosscut and one in ore, these ranging from 150' to 2,500' in length, with a total of about 15,000' of underground openings, exposing circa 600,000 tons of ore, with about 100,000 tons blocked out for stoping. Mine was opened 1821, closed 1873, and reopened 1895, by present owner. Mine is 300 miles from a railroad, but only 300 feet from the sea, by which shipments are made and received. Equipment includes hoists, air and diamond drills, electric light, etc. Power is supplied by a Pelton wheel fed by a 1,000' waterfall. The concentrator has 100 tons daily capacity. Annual production is about 30,000 tons of raw ore, which is concentrated into 2 grades, first averaging 12% copper, and second 4% copper and 50% sulphur. Property has an excellent management.

GEWERKSCHAFT ALTFALTER.

GERMANY.

Mine office: Altwaltnau, Hirschberg-Grosselmerode, Hossen-Nassau, Ger-

many. Has copper-lead ores, developed by one shaft, and employed about 30 men, at last accounts.

ALTO COPPER CO.

ARIZONA.

Office: 43 Exchange Pl., New York. Mine office: Patagonia, Santa Cruz Co., Arizona. Geo. A. Beaton, president; Geo. O. Earhart, secretary; Geo. J. Lockley, treasurer; J. N. Curtis, general manager; J. J. Jones, mine superintendent; J. W. Prout, Jr., engineer. Organized April 4, 1905, under laws of Maine, with capitalization \$3,000,000, shares \$100 par. Bonds, \$750,000, at 7%. Annual meeting, first Tuesday in April. Lands, 21 claims, area 420 acres, 8 miles from Patagonia, in the Santa Rita Mountains, near the Mexican border, developed by tunnels of 187' and 400' and by about 50 antigua shafts, of 30' to 70', and by 3 new shafts of 73', 100', and 150', with circa 3,000' of underground openings, which are estimated by the company to show 500,000 tons of ore blocked out for stoping, which is unduly high. Ores give assays of 8% to 12% copper, 10% to 20% lead, 10 oz. to 30 oz. silver and \$3 to \$20 gold per ton, from chalcopryite, associated with galena and sphalerite. Has a good steam power equipment, 3 hoists, good for 600' each, 8-drill Sullivan air-compressor and 8 power drills. Has a 20x40' machine shop, smithy, and about 25 miscellaneous buildings, including dwellings. Company reports that it is employing about 100 men, and operations seem to be conducted on a business-like basis. The ore, from its complicated nature, will prove refractory in reduction.

ALVERSTONE MINE.

CALIFORNIA.

Mine office: Placerville, El Dorado Co., Cal. Was developing by tunnel, early in 1906.

ALVERDSKI GROUP.

RUSSIA.

Mine office: Alverdschi, Bortschalo, Tiflis, Russia. Is said to be owned by a French syndicate. Is a new property of a considerable promise, with vigorous management. Production, 1903, was approximately 2,000,000 lbs. fine copper, with promise of a considerable future increase.

AMADOR CONSOLIDATED MINING & DEVELOPMENT CO. MONTANA.

Office: 507-172 Washington St., Chicago, Ills. Mine office: Iron Mountain, Missoula Co., Mont. Joseph Sherlaw, president; D. E. Mackinnon, secretary; Robt. M. Mahler, treasurer. Organized March 16, 1903, under laws of Arizona, with capitalization \$10,000,000, shares \$5 par, as a reconstruction of the Amador Copper & Gold Mining & Milling Co., to secure additional funds necessary for development. Lands, 18 claims, area 355 acres, also 2 groups of patented placer-gold claims, area 180 acres, with 5 mill and smelter sites and 450 acres miscellaneous lands, showing 5 fissure veins in slates and quartzite, of which 3 veins, claimed to be of 40' to 270' width, are undergoing development, these giving oxide and sulphide ores, mainly chalcopryite, with a little chalcocite, said to assay 3% to 34% copper, 3 oz. to 16 oz. silver and \$6 gold per ton. Main ore body on the east drift of the 250' level is claimed by company to be 1,325' long and 35' wide, with 10' of sulphide smelting ore and about 20' of fair sulphide concentrating ore. Main shaft is 400', with tunnels of 187', 512', 632', and 662', estimated

by company to show 365,000 tons of ore blocked out for stoping. Has a 2-mile flume and pipe-line, delivering water at mine under a 310' head. Has an air-compressor, 4 power drills, 2 hoists and 15 mine buildings and dwellings, and a sawmill. Company has refused for past 4 years to permit anyone but workmen to inspect its mine, hence information as to the large ore bodies rests solely upon the statement of the company, and its engineers, paid for official reports. Shipments of ore were begun March, 1906, and it is to be hoped that hereafter the management will be able to make good its lavish promises of steady production and large dividends.

AMADOR COPPER & GOLD MINING & MILLING CO. MONTANA.

Reorganized, 1903, as Amador Consolidated Mining & Development Co. **GEWERKSCHAFT VER. AMALIA- UND KNOTTENBERG. GERMANY.**

Letter returned unclaimed from former mine office, Mornshausen an der Dautphe, Hessen-Nassau, Germany. Adolph Freund, president; Paul Marcus, engineer. Capitalization, 1,400,000 marks. Has cupriferous silver-lead ores, opened by one shaft.

AMALGAMATED COPPER CO. MONTANA.

Office: 42 Broadway, New York. Henry H. Rogers, president; F. O. Addicks, vice-president; A. H. Melin, secretary and treasurer; John D. Ryan, managing director; H. H. Rogers, Albert C. Burrage, W. M. Rockefeller, H. H. Rogers, Jr., Fred P. Olcott, James Stillman, Anson R. Flower, J. D. Ryan, and Geo. H. Church, directors. Organized April 27, 1899, under laws of New Jersey, with capitalization \$75,000,000, increased, 1901, to \$155,000,000, shares \$100 par. Central Trust Company of New York and National Shawmut Bank of Boston, registrars. National City Bank of New York and Kidder, Peabody & Co., of Boston, transfer agents. Annual meeting, first Monday in June.

The Amalgamated is a securities holding corporation, not a mining company, with assets consisting mainly of stock in sundry subsidiary companies. Stock of the following named corporations is entirely owned by the Amalgamated, with the exception of the few founders' shares, required to be in the names of directors: Washoe Copper Co., capitalization \$5,000,000; Colorado Smelting & Mining Co., (Trenton), capitalization \$2,500,000; Diamond Coal & Coke Co., capitalization \$1,500,000; Big Blackfoot Milling Co., capitalization \$700,000. In the following named corporations the Amalgamated holds from practically the entire issue, as in the case of the Boston & Montana, to a majority interest only, as in the Anaconda: Boston & Montana Consolidated Copper & Silver Mining Co., capitalization \$3,750,000; Parrot Silver & Copper Co., capitalization \$2,298,500; Butte & Boston Consolidated Mining Co., capitalization \$2,000,000; Anaconda Copper Mining Co., capitalization \$30,000,000. The Amalgamated also is credited with owning a controlling interest in the United Metals Selling Co., but in all likelihood the control is held by Amalgamated officers, rather than by the company. The Hennessey Mercantile Co., which was profitable but unpopular, was sold, 1904. Miscellaneous holdings of the Amalgamated include 27,000 acres of timber lands; a large stock interest in the Anaconda & Pacific

R. R. Co.; the Republic Sampling Works, at Butte; a sawmill at Ravalli, Hamilton county, Montana; hotels at Anaconda and Hamilton; business blocks in Butte and Anaconda, and several daily newspapers. One of the newspapers is highly profitable, but the others are not. The settlement of the Heinze fight probably will lead to the weaning of several subsidized journals.

The subsidiary mines and other enterprises of the Amalgamated employ circa 13,000 men, mainly at Butte, Anaconda and Great Falls, Montana, with an annual payroll of about \$15,000,000.

The Amalgamated Copper Company was formed, in 1899, to control the copper industry of the world. Lamentable failure ensued in 1901, whereupon the management began, for the first time, to evince business ability, by learning the business that the company had engaged in, and stopping up the leaks. The material progress scored by the Amalgamated has been especially notable since John D. Ryan became managing director, in 1904. In two years Mr. Ryan has done much to strengthen the company's position. The Heinze war has been settled, the "company store" has been sold, the friendship of the employes has been retained and strengthened, and the Amalgamated has been made stronger in every direction.

The copper mines controlled by the Amalgamated are looking well, without exception. The settlement of the litigation with the Heinze forces will permit the working of a number of good properties tied up for years by injunctions. The Amalgamated's share of the production made by mines controlled by it somewhat exceeded 200,000,000 lbs. fine copper in 1905. This will be increased in 1906, and 1907 should show a further considerable gain.

The Amalgamated has been run as a close corporation, thanks to the laws of New Jersey, which permit the legal offspring of that state to conduct their affairs in any manner whatsoever, so long as the required taxes are paid regularly to the state. During the past year a more liberal tendency has been noted, and a financial statement—the first rendered—was given shareholders at the annual meeting of June, 1905. This, while good as far as it went, was entirely too much condensed to be satisfactory. It seemed too much like asking a hungry laborer to make a full meal off a maccaroon.

The "Story of Amalgamated," printed by Thos. W. Lawson, as a serial in Everybody's Magazine, cannot be accepted seriously by any person cognizant of the facts of which Lawson attempts to treat. The "Story" is merely a clever piece of fiction; so contrived that the author stands in the limelight throughout. The Amalgamated management made some very bad mistakes in the early years, and did some things for which the word "mistake" seems very charitable, but Lawson has so mingled fact and fiction that both are alloyed. The best disposal of the virtuous Lawson can be made by comparing his copper company with that of H. H. Rogers. The Amalgamated employs 13,000 men—Lawson's company, the Trinity, employs 3 men—and the Trinity was born but a few months later than the Amalgamated.

Earnings of the Amalgamated for 1905 probably were about \$13,000,000, or a little better than \$8 per share. Cost of producing copper was nearly

or quite one cent per pound less than two years previously, this alone representing an addition of about \$2,000,000 to the profits. Earnings from other sources than copper mines probably were another \$1,000,000. Dividends for 1905 were \$6,975,000, as against \$3,100,000 for each of the two preceding years. The high-water record was reached in 1901, with dividends of \$11,625,000. In 1906 the dividends should be increased.

AMALGAMATED GOLD & COPPER CO.**ARIZONA.**

Dead. Was located at Huron, Yavapai county, Arizona, where a 300' shaft was sunk. Company was promoted by Douglas, Lacey & Co., a firm of swindlers maintaining sumptuous offices at 66 Broadway, New York, with about 40 branch offices in the United States and Canada, from which worthless mining stocks are peddled. The firm claims to operate on the law of averages, and, by handling many mines, to permit the good ones to make up for the failures. Considerable bluffing has been done in the way of crude mining operations, but these evidently were merely for the purpose of keeping up appearances. No mining company promoted by this firm ever has earned a profit, so far as can be learned. Dividends have been paid on shares when no profits have been earned, for which Douglas, Lacey & Co. should be jailed for common swindlers, and doubtless would be, were the laws of the United States administered solely with a view to justice.

Stock in worthless companies was exchanged for stock in equally worthless companies, whenever "investors" grew tired, and the victims of the conspiracy were tolled along on the "dividends" paid out of the money they themselves had furnished. Cash dividends have been suspended for several years, being replaced by "scrip" dividends. As far as can be learned, this firm has bilked about 20,000 small investors, including many widows and orphans, in the United States and Canada, out of several millions of dollars. It is understood that the firm is endeavoring to include England in its operations. There seems no reason to think that the English officials will be less complaisant than those of the United States, as the firm has money. By virtue of advertising in the financial and mining press of the United States, criticism has been forestalled, as there are comparatively few publications, of this class that are not edited from the business office.

In November, 1903, a formal complaint against this firm was lodged with the United States postal department, but nothing has come of the matter, despite repeated attempts to learn why the firm is not investigated. The postal department has shut out of the mails a number of small swindlers, but evinces no desire to restrict the operations of the big rascals. It is to be hoped that eventually Congress may decide to thoroughly investigate the postal department, and learn definitely what particular official, or officials, is in receipt of hush-money. This case has been called personally to the attention of Mr. Geo. B. Cortelyou, postmaster-general, but without results.

AMARILLA COPPER CO.**NEW MEXICO,**

Letter returned unclaimed from former office, Boston, Mass. Mine office: Jarilla, Otero Co., N. M.

AMAZON GOLD CO.**MEXICO.**

Office: 507 Commercial Bldg., St. Louis, Mo. Mine office: Chacala, Sinaloa, Mex. Jas. T. Dugan, president; Edward B. Sowers, manager; J. S. Wilkinson, superintendent; J. E. Arnold, assistant superintendent. Ores carry gold, silver and copper. Equipment includes a Bryan mill and a 10-ton smelter.

AMERICA-BRITANNIA MINING CO.**WASHINGTON**

Mine office: Baring, King Co., Wash. Presumably idle.

AMERICAN AMALGAMATED SMELTING & MINING CO.**ARIZONA.**

Supposed to own the Pyramid group of claims, in Pinal county, Arizona.

AMERICAN CONSOLIDATED COPPER CO.**MONTANA.**

Offices: 60 State St., Boston, Mass., and 42 Broadway, New York. Larkin T. Trull, president, as a stop-gap; Timothy E. Hopkins, treasurer; David W. Snow, secretary; Joseph A. Coram, promoter and real manager. Organized 1905, under laws of Maine, with capitalization \$65,000,000, shares \$100 par; capitalization increased later to \$150,000,000. Charter is of a sweeping nature, giving company permission to do about anything it pleases, except commit murder. It was planned to have an original issue of \$36,500,000, but Mr. Coram ran into the Standard Oil people, and found himself sidetracked. Property apparently consists of sundry options on Butte mining property owned by the A. J. Davis Estate, and options on the property of the Montana Coal & Coke Co. It also has been asserted in the press that company has stock in the Balaklala mine, and in the Mexican Consolidated Mining & Smelting Co. The American Consolidated Copper Co. is a very ambitious undertaking, perhaps too much so, and for the property named, is much overcapitalized. Apparently Mr. Coram's plan was to organize a holding company along somewhat the same lines as the Amalgamated, but the undertaking seems to have been too great for his strength.

AMERICAN CONSOLIDATED COPPER CO.**NEW MEXICO.**

In liquidation. Fully described in Vol. V.

AMERICAN CONSOLIDATED MINES CO.**NEW MEXICO.**

Office: 23 Postoffice Bldg., Colorado Springs, Colo. Mine office: Twinning, Taos Co., N. M. Employs 12 men. J. Shumaker, president; C. D. Weimer, secretary and treasurer; O. H. Stanley, general manager; E. H. Souther, superintendent. Organized November, 1901, under laws of New Mexico, with capitalization \$3,000,000, shares \$1 par. Lands, 19 claims, area 380 acres, also a 5-acre millsite and a half interest in 380 acres of timber lands, in the Rio Hondo and Lake Fork districts. Has secured assays of 3% copper and \$16 gold per ton, from ores cut in 3 tunnels longest 510'. Apparently has large ore bodies of low grade; and company seems honestly managed.

AMERICAN COPPER CO.**ARIZONA.**

Mine office: Globe, Gila Co., N. M. Organized 1905, to operate in vicinity of Globe. As a company by precisely the same name had been previously chartered, to operate in the adjoining county of Yavapai, it is

probable that the Globe company was not chartered under Arizona laws, or else that title has not been reported correctly.

AMERICAN COPPER CO.**ARIZONA.**

Office: 11 Broadway, New York. Mine Office: Humboldt, Yavapai Co., Ariz. J. K. Burnham, president; A. S. Kimberley, secretary and treasurer; Benj. Blanchard, superintendent. Organized under laws of Arizona with capitalization \$5,000,000, shares \$1 par. Lands, 20 claims, area 400 acres, including the Iron King mine, in the Big Bug district. Has 7 shafts, deepest 100', 210', 250', and 385', with about 5,000' of underground openings, showing a large ore body, claimed to have 350,000 tons, averaging \$10 per ton, of ore blocked out for stoping. Principal values are in gold and silver, with lead and copper as by-products. Has steam power and a 6-stamp mill, of 40 tons daily capacity, also a 50-ton cyanide plant. Has electric light, steam and water power, necessary mine buildings, dwellings for workmen, store and combination church and school building. Company came to grief in 1905. Presumably succeeded by American Gold & Copper Consolidated Co.

AMERICAN COPPER CO.**WYOMING.**

Office: 327 Pine St., Williamsport, Pa. Mine office: Holmes, Albany Co., Wyo. Employs 6 men. Thos. M. B. Hicks, president and treasurer; Otto C. Clinger, secretary; P. F. Kelly, superintendent. Organized Aug. 23, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 40 claims, area 800 acres, in the Douglas Creek division of the Encampment district, showing a fissure vein in granite, 20' wide at depth, and composed of three distinct layers, first being porphyritic, with width of 6' to 7' and carrying about 1.5% copper and \$7 gold per ton, with some covellite assaying 60% copper and \$20 gold per ton; second layer, of 6' to 7', is of jaspelite and diorite, carrying decomposed iron ore assaying \$20 to \$150 gold per ton; the third layer is brecciated, carrying oxide, carbonate, and sulphide ores of copper, with quartz gangue. Has a 3-compartment main shaft, 350' deep, planned to be sunk to 1,000', also other shafts of 50', 60' and 160', with a total of about 1,800' of mine openings. Has a 100-h. p. steam equipment, with Norwalk air-compressor, power drills and necessary mine buildings. Property regarded as promising.

AMERICAN COPPER & GOLD CO.

Office: 43 Leonard St., New York.

AMERICAN COPPER MINING CO.

John Baker, former president and general manager, reports company dead.

AMERICAN COPPER MINING CO.

Dead. A stock-jobbing outfit, formerly at 40 Wall street, New York. Promoted, on wind, by Ralph M. Jacoby, and others of his ilk.

AMERICAN COPPER MINING CO.**NEW JERSEY.**

Office: 20 Broad St., New York. Mine office: Somerville, Somerset Co., N. J. Josiah C. Reiff, president; W. S. Chapman, secretary; Josiah Bond, general manager. Organized 1885, under laws of New York, with

capitalization \$500,000, shares \$1 par. Lands are mining rights to about 1,000 acres, and a 50-acre millsite owned in fee. Ore occurs as blanket veins between trap and shale, these having an average thickness of 2' and being traceable nearly 4 miles, carrying an estimated minimum average of 2% to 2.5% copper, with small gold and silver values. Native copper occurs at depth, with various oxides and carbonates above, in a gangue of altered shale. Mine is opened by 3 inclines, of 155', 450', and 1,300', and by a 500' crosscut drainage tunnel. Has steam power, with 30-h. p. hoist, 5-drill Rand air-compressor and drills, tramway and necessary mine buildings. The concentrator is of wood and stone, with daily capacity of 50 tons, having 2 rolls, screens, crushers and 2 Wilfley tables. Product, when mine is operated, is turned out as concentrates, shipped to smelters on New York harbor. Idle for several years past.

AMERICAN COPPER MINING & EXTRACTION CO. COLORADO.

Office 828 Equitable Bldg., Denver, Colo. Owned the Gardiner copper leaching and precipitating process, in use at the Denver plant of the Union Ore Extraction & Reduction Co.; process since sold to the Commonwealth Reduction Co. Apparently owns no mining property.

AMERICAN COPPER MINING & MILLING CO. UTAH.

Letters returned unclaimed from former mine office, Simpson Springs, Utah.

AMERICAN COPPER MINING & SMELTING CO. NEW MEXICO.

A "fake," promoted by J. R. Kerr & Co., formerly at 555-11 Broadway, New York.

AMERICAN DEVELOPMENT CO. ARIZONA.

Succeeded, March, 1906, by American-Saginaw Development Co.

AMERICAN EAGLE COPPER MINING CO. WYOMING.

Letter returned unclaimed from former mine office, Encampment, Wyo.

AMERICAN EAGLES GROUP. CALIFORNIA.

Mine office care of A. L. Crew, Needles, San Bernardino Co., Cal. Lands, sundry claims, circa 40 miles south of Needles and 10 miles west of the Colorado river, on which a little work was being done by Needles parties, late in 1905.

AMERICAN FLAG MINE. UTAH.

Office: care of E. B. Palmer, secretary, Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Capt. T. F. Singiser, president; John G. Rhodin, superintendent. Ores carry 1% to 2% copper, 4% to 6% lead, and up to 60 oz. silver and \$7.50 gold per ton. A new and efficient hoisting plant was installed in 1905.

AMERICAN GOLD & COPPER CONSOLIDATED MINING CO. ARIZONA.

A tentative reorganization, circa 1905, of the American Copper Co., of Yavapai county Arizona.

AMERICAN GOLD & COPPER CO.

Office: 951 Tremont Bldg., Boston, Mass.

AMERICAN GOLD & COPPER CO. ARIZONA.

Office: 401 Henne Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Morristown, Maricopa Co., Ariz. J. J. Hawkins,

attorney. Capitalization \$1,000,000, shares \$1 par. Lands, circa 100 acres, including Fitzhugh Lee, Joe Wheeler and Eddy mines. Has auriferous and argentiferous copper ore, with considerable development, steam power and 10-stamp mill.

AMERICAN GOLD & COPPER MINING CO.**WYOMING.**

Office: 1431-79 Dearborn St., Chicago, Ills. Mine office: Jelm, Albany Co., Wyo. Albert L. Stone, president; J. C. Essick, secretary; Louis Miller, general manager. Capitalization, \$5,000,000. Lands, 14 claims, held by location. Has slightly developed auriferous copper ores. Has a 5-stamp gold mill. Idle at last accounts, but management was endeavoring to secure funds to resume work.

AMERICAN GOLD MINING CO.**COLORADO.**

Office: 304-411 Olive St., St. Louis, Mo. Mine office: Ouray, Ouray Co., Colo. Employs 40 men. W. C. Wrisberg, president and general manager; Ernest P. Olshausen, secretary and treasurer; V. A. Laughlin, superintendent; Ed. Wall, mine superintendent. Organized 1889, under laws of Colorado, with capitalization \$3,000,000, shares \$10 par. Has paid dividends of \$420,000. Lands, 13 patented claims, area 200 acres, including the American Nettie and West View mines, also a 50-acre millsite, in the Ouray district. Country rocks are granite, shale and quartzite. Produces oxide and sulphide ores averaging 2% copper, 1% lead, 20 oz. silver and 20 cents gold per ton. Has about 75,000' of underground openings, with a large amount of ore blocked out and in sight. Has steam, electric and water power, with a 40-stamp mill and concentrator, shipping concentrates to the Pueblo smelter.

**AMERICAN GOLD MINING COMPANY,
OF NEW MEXICO.****NEW MEXICO.**

Office: 312 Tacoma Bldg., Chicago, Ills. Mine office: Nogal, Lincoln Co., N. M. A. T. Anderson, president; John Monk, secretary; J. M. Rice, manager; M. D. Gaylord, superintendent. Lands include the American, Helen, Old Abe and other mines, carrying ores of copper, gold, silver and lead. Has steam and electric power, with a 50-stamp mill and 50-ton cyanide plant.

AMERICAN-MEXICO MINING & DEVELOPING CO.**MEXICO.**

Office: 1018 National Life Bldg., Chicago, Ills. Mine office: San Lorenzo, Durango, Mex. Dr. W. S. Phillips president; H. E. Graham, vice-president; A. T. Grove, secretary and treasurer; G. E. Fitzgerald, general manager; John Dalton, mine superintendent; John Brady, smelter superintendent. Organized 1902, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par; issued, \$1,267,544. Begun paying dividends of 2½% monthly, in April or May, 1903, from stock sales, and president assures the Copper Handbook that to March, 13 1906, company had paid dividends of \$357,318.34.

Mining lands are reported by company as approximately 3,000 acres, with a 1,500-acre smelter site, at San Lorenzo and an 805-acre smelter site at Torreón. Mines include La Roca Negra, Tecolotes and others. Company

claims to be developing 8 mineral bodies, averaging 3 meters width, showing ore averaging 2% copper, 7% lead, 30 oz. silver and \$7 gold per ton. Has 5 shafts, deepest 350', also 5 tunnels, of 500', 800', 1,000', 1,200' and 3,000', estimated by company to show 150,000 tons of ore, with 60,000 tons blocked out for stoping. Company reports a 200-h. p. steam plant at the smelter. Smelter, at San Lorenzo, 3 to 6 miles from the mines, is reported by Dr. Phillips to have furnaces of 50, 100, and 200 tons daily capacity. Press reports are that the 50-ton furnace was blown in during March, 1906. Product is a 15% matte. Production of company is reported as 261,531 lbs. fine copper in 1904, and approximately 300,000 lbs. fine copper in 1905.

La Roca Negra mine, sometimes called La Victoria, was bought of Carlos von Brandeis for \$60,000. It is a good mine, but a small one, and its 3 veins average 6" to 9" width only, and not 3 metres. Its area is 10 pertenencias only—a trifle less than 25 acres.

Production during 1904 was at the rate of about one carload of very rich ore monthly, and it is impossible to see where the reported production of copper came from.

A. T. Benson, a shareholder, brought suit in a South Dakota court, and Thos. H. Null, of Huron, South Dakota, was appointed receiver for the company. Benson charges in his suit that the officers received 600,000 shares of stock without rendering an equivalent, and that they made large profits at the expense of the company by issuing options on treasury stock, at prices below those demanded by the company, and that dividends were paid from stock sales and not from earnings of the mine and smelter.

La Roca Negra is a good small mine, but the operations of the American-Mexico company have been regarded with deep and apparently well-founded suspicion, by mining men on the ground, and by others conversant with the company's operations. There seems no reason to change the unfavorable opinion of this concern expressed in the last issue of the Copper Handbook.

AMERICAN MINES DEVELOPMENT CO., LTD.

Office: 506 Oneida Bldg., Minneapolis, Minn. P. R. Bailey, president; Jas. T. Manning, secretary, treasurer and manager. Claims to own and to be developing copper, gold, zinc, lead and oil properties, but location of property, if any, is unknown, and company apparently is either a fake or a mistake.

AMERICAN MINING CO.

IDAHO.

Letter returned unclaimed from former mine office, Weiser, Washington Co., Idaho.

AMERICAN MINING CO.

MEXICO.

Mine office: La Cananea, Sonora, Mex. John H. Talbot, manager. Organized under laws of Colorado. Lands, 126 pertenencias, adjoining the Cobre Grande mine of the Greene Consolidated, with a strike of 4,000' on the mineral zone. Main shaft is 250' and located 200' from the Cobre Grande workings. Also has 2 other shafts, one, the Republic, 175', being 1,500' west of the main shaft, on the parallel Veta Grande zone of the Greene Con-

solidated, with drifts in ore assaying 5.5% copper, 3.5 oz. silver, and \$1.20 gold, per ton. Main shaft is said to show a 56' vein of disseminated chalcocite, assaying 5.6% copper, 13.4 oz. silver, and \$1.84 gold, per ton.

AMERICAN MINING CO.**UTAH.**

Said to have promising claims near Mineral Springs, about 15 miles northwest of Death Cañon, in the Deep Creek district, opened by a 180' tunnel, from which several smelter shipments of ore of good grade were made during 1904. No later developments ascertained.

AMERICAN MINING & DEVELOPMENT CO.**MEXICO.**

Office: care of Duey & Overlock, Bisbee, Ariz. Chas. McHenry, superintendent. Lands, sundry claims, a few miles south of Naco, near the Arizona-Sonora border.

AMERICAN MINING, MILLING & SMELTING CO.

Offices: care of Weston & Co., 10, Coleman St., London, E. C., Eng. "James Reid," president and treasurer; "H. Reid," secretary; "W. Matthews," general manager. The American Mining, Milling & Smelting Co. is a rank swindle, incorporated under American laws, but feeding upon the gullibility of the residents of Great Britain, where it is domiciled, under the wing of Weston & Co., a more than shady London concern. The company claims to possess mines in Alaska, Arizona, California, Colorado and Mexico. None of these alleged mines have been located. Formerly had a representative at 78 Wall St., New York, in the person of Wm. C. Hickman, a crooked promoter, who also ran a bogus rating agency, known as the Financial Mercantile Agency, which, for a consideration, reported favorably on fraudulent financial schemes. Hickman is under indictment and a fugitive from justice.

The financial press of Great Britain and the United States has been fully informed of the fraudulent nature of this concern, and it may be assumed, with entire safety, that any financial or mining journal puffing the shares of this utterly putrid concern is doing so for a cash consideration, knowing that it is taking hush-money at the expense of its deluded readers. As was stated last year, the American Mining, Milling & Smelting Co., is a swindle of the most rotten and bare-faced sort, and every man connected with it is either a fool or a rascal.

AMERICAN PROSPECTING & DEVELOPMENT CO.**ARIZONA.**

Office: Bisbee, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Lands, sundry claims, adjoining the Equator mine. Has a 43' shaft with a 112' drift in ore.

AMERICAN QUEEN MINING CO.**COLORADO.**

Mine office: Gold Hill, Boulder Co., Colo. Property is the Cash mine, carrying ores of gold, silver and copper, latter a by-product of limited amount. Has a 25-ton mill, with 10 stamps.

AMERICAN-SAGINAW DEVELOPMENT CO.**ARIZONA.**

Office: 510 Lyceum Bldg., Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Thos. H. Collins, president; Chas. d'Autremont, Jr., vice-president; Frederick R. Kennedy, secretary; Wm. G. Haggart, treasurer; preceding officers, Henry B. Hovland, Wm. B. Mershon and Watts S. Humphrey, di-

rectors; L. W. Powell, general manager. Organized March 7, 1906, with capitalization \$1,000,000, shares \$10 par, succeeding the American Development Co. and Saginaw Development Co. Stock was issued half to shareholders of each of the old companies, marked \$3 paid, and a further assessment of \$3 was levied shortly thereafter, payable \$2 May 1 and \$1 July 1, 1906, last call being to provide funds to meet payment of a balance of \$209,710.20 due on the property. Lands, 26 claims, of which the American furnished 9 claims, lying next east of the Junction and Calumet & Pittsburg, and the Saginaw furnished 17 claims, area 297 acres, also favorably located, and including the Muheim and Worlds' Fair groups. Development is on the Saginaw group, which has an old 384' shaft, sunk at an angle of 70° with the horizon, showing 35' of leached ore on the 300' level, and the new Saginaw 3-compartment 912' shaft, which cut a 35' body of low-grade ore on the 350' level. The Saginaw shaft has a double-drum first-motion hoist, with capacity for raising 4-ton skips 1,400', and also has a good pumping equipment. Management is excellent and property is regarded as well located.

AMERICAN SMELTERS EXPLORATION CO.

Organized early in 1905, and title changed soon thereafter to American Smelters Securities Co.

AMERICAN SMELTERS SECURITIES CO.

U. S. A. & MEXICO.

Office: 71 Broadway, New York. Daniel Guggenheim, president; Barton Sewell, S. W. Eccles and Edward Brush, vice-presidents; G. M. Borden, secretary; Morris Guggenheim, treasurer; E. C. Palmer, general manager; W. S. Morse, assistant manager; W. C. Potter, Mexican manager; William R. Rust, business manager; Alfred von der Ropp, metallurgical superintendent. Organized March 25, 1905, under laws of New Jersey, as American Smelters Exploration Co.; name changed to present title May, 1905. Capitalization \$77,000,000, shares \$100 par, divided into \$17,000,000 Series A cumulative 6% preferred stock, at \$30,000,000 Series B cumulative preferred stock at 5%, and \$30,000,000 common stock. Series A has preference as to dividends, and both preference series have equal rights as to assets, both having priority over common stock. The American Smelters Securities Co. is controlled by the American Smelting & Refining Co., through ownership of a majority of the issue of common stock, and the American Smelting & Refining Co. guarantees the Series B preferred stock. First quarterly dividend was paid July, 1905, on Series A. Morton Trust Co., registrar. Annual meeting, first Wednesday in September.

The American Smelters Securities Co. is merely a subsidiary corporation of the American Smelting & Refining Co., and in turn controls a number of smaller corporations, including the Guggenheim Exploration Co., Selby Smelting & Lead Co., Tacoma Smelting Co., Puget Sound Reduction Co., and others.

Among the mining properties controlled are the Silver Lake mines at Silverton, San Juan county, Colorado, which produce ores of gold, silver, lead and copper, and have steam, water and electric power, with a 400-ton concentrator, employing circa 200 men.

The Santa Maria y Anexas mines, at Velardeña, Durango, Mexico, have auriferous and cupriferous silver-lead ores, extensively opened. The mines have steam and gasoline power and a 500-ton smelter, employing about 600 men at last accounts.

The company also owns the Gibosa y Anexas mines, at Jiminez, Chihuahua, Mexico.

The Mina Tepezalá at Tepezalá, Aguascalientes, Mexico, has silicious silver-copper pyrites, opened by a 560' main shaft. Has a good power plant and employs several hundred men.

The Dolores y Anexas, at Matehuala, San Luis Potosí, Mexico, include the Dolores, Trinidad, and Azul mines, employing about 500 men. F. J. Foster, superintendent; L. A. Roan, engineer. Lands, 93 pertenencias, area 230 acres. Veins occur as contacts between limestone and porphyry, carrying sulphide ores with garnetiferous gangue, returning an average of 7% copper, 3.8 oz. silver and \$1.50 gold per ton. The San Miguel shaft is 600' deep and the San Miguel tunnel is 1,500' long, the mine having about 8,000' of underground openings. Has gasoline power and is reached by the Porvenir de Matehuala railroad. Production, 1902, was 2,481,832 lbs. fine copper, from 17,756 metric tons of ore treated, giving an average return of 6.34% copper. Production, 1904, was 4,015,000 lbs. fine copper.

The works of the Selby Smelting & Lead Co., at Selby, Contra Costa county, California, include an extensive refining plant, with steam and electric power, drawing ore supplies from the Pacific coast and from some distance in the interior. The works of the Puget Sound Reduction Co., at Everett, Snohomish county, Washington, includes three 30x180" blast furnaces, one of which runs on copper ores, making a 50% matte which is blown up to blister copper in a reverberatory furnace and shipped east for electrolytic refining. This plant is one of the two producers of arsenic in the United States, making about 5 tons of arsenic daily from Monte Cristo ores, at last accounts.

The plant of the Tacoma Smelting Co. includes an extensive and well-located site on tidal water, flats being reclaimed by filling in with slag. There are extensive wharves, with ore-bunkers and automatic unloading devices, a small electric tram-line connecting the wharves with all parts of the works. The smelting plant includes 4 lead stacks, 100-ton blast-furnaces, with three Connorsville blowers driven by a 200-h. p. Westinghouse induction motor. The copper smelter include three 60-ton mechanical roasters, two 10-ton hand-roasters, and a 400-ton 42x160" water-jacket blast-furnace, with fore-hearth 14' in diameter and 4' high, holding 60 tons of molten matte. A 36" cupola remelting furnace, with outside settler, can treat 75 tons of 50% matte daily. The convertor department has two stands and six 72x100" barrel-type shells, with a 30-ton electric crane.

The company is said to plan the construction of a 125-mile railroad from Valdez to the Bonanza mine, and also to plan erecting a copper smelter in the vicinity of Valdez. Company is said also to plan taking over important properties in the Bingham district, and elsewhere.

It is expected that earnings will exceed \$5,000,000 yearly. The management of this company is strong, experienced and aggressive, and the corporation should be heard from to an increasing extent in the copper field during the years to come.

AMERICAN SMELTING & REFINING CO. NORTH & SOUTH AMERICA.

Office; 71 Broadway, New York. Works offices, at numerous addresses given hereafter. Daniel Guggenheim, president; Barton Sewell, Edward Brush, and S. W. Eccles, vice-presidents; W. E. Merriss, secretary; Isaac Guggenheim, treasurer; August Raht, mechanical engineer. Organized April 4, 1899, under laws of New Jersey, with capitalization \$54,600,000, increased to \$100,000,000, in \$50,000,000 cumulative 7% preferred and \$50,000,000 common stock. For the fiscal year 1900, net earnings were \$3,524,961, equal to nearly 6.5% on the then capitalization of \$54,800,000. In 1904 net earnings were \$7,905,573, and for fiscal year ending April 30, 1905, net earnings were \$8,898,811, or nearly 9% on the present capitalization. Pays dividends of 7% on both common and preferred stock. To October, 1905, has paid dividends of \$10,875,000. Controls the American Smelters Securities Company, through ownership of \$17,751,000 of the common stock issue of \$30,000,000, and owns 25,000 shares, par \$2,500,000, of Series B preferred stock of the same company, bought for \$2,302,270, and has guaranteed 5% dividends on the entire issue of \$30,000,000 Series B preferred stock of the American Smelters Securities Co.

In addition to various smelting plants and stock interest in the American Smelters Securities Co., the American Smelting & Refining Co. also owns the exclusive rights to the Huntington-Heberlein ore-roasting patents in the United States and Mexico. A profit-sharing fund is maintained for employes occupying positions of responsibility, this fund, which is rapidly growing, amounting, September 1905, to \$216,815. Company ended fiscal year 1905 with a surplus in cash and quick assets of \$6,458,720.

The company has smelting plants with an annual capacity of approximately 5,000,000 tons of raw ore and concentrates. Principal reduction works are as follows;

Murray Smelter, at Murray, Salt Lake Co., Utah. R. D. Rhodes, superintendent. Has steam and electric power, with daily capacity of nearly 2,000 tons, employing about 1,000 men.

Germania Lead Works, at Salt Lake City, Utah.

Hanauer Smelting Works, at Salt Lake City, Utah.

United States Smelter, at Helena, Montana.

United States Smelter, at Great Falls, Montana.

Omaha Smelter, at Omaha, Neb.

Grant and Globe Smelters, at Denver, Colo. Franklin Guiterman, manager; H. H. Alexander, superintendent.

Pueblo Smelting & Refining Works, Pueblo, Colo. Geo. A. Harsh, superintendent.

Philadelphia and Pueblo Smelters, Pueblo, Colo. W. H. Howard, superintendent.

San Juan Smelter, Durango, Colo.

Bi-Metallic Smelter, Leadville, Colo.

Pennsylvania Lead Smelter, Salt Lake City, Utah.

Pennsylvania Smelter, Pittsburg, Kans.

Chicago & Aurora Smelter, Aurora, Ills.

Chicago & Aurora Smelter, Leadville, Colo.

Kansas City Smelters, Kansas City, Mo.

El Paso Smelter, El Paso, Texas, F. C. Earle, superintendent.

Guggenheim Smelter, Monterey, N. L., Mexico.

Guggenheim Smelter, Aguascalientes, Agsc., Mexico. Has two 300-ton convertible furnaces, used interchangeably on copper and lead ores.

El Carmen Smelters, Sierra Mojada, Chihuahua, Mexico.

Playa Blanca Smelter, Antofagasta, Chili, leased from the Compañía Minera Huanchaca.

Through control of the American Smelters Securities Co., the American Smelting & Refining Co. controls smelters on San Francisco Bay, on Puget Sound and at Velardeña, Durango, Mexico.

The Garfield Smelter is being built at Garfield Beach, on Salt Lake, not far from Salt Lake City. This will have a daily capacity of 2,000 tons, and will cost, complete, upwards of \$1,500,000. It should be blown in during 1906.

A new copper and lead smelter in Chihuahua is said to be planned.

The Guggenheim Refinery, at Perth Amboy, N. J., was built in 1895 and has been greatly enlarged at various times since. This plant has the advantages of tide-water in front and rail connections at the rear. The works include copper and lead furnaces and a large electrolytic plant. There also is a bluestone plant, which makes large quantities of copper sulphate. The refining capacity of these works will be brought up to 60,000,000 lbs. of copper yearly, during 1906.

During 1905 the American Smelting & Refining Co. turned out from its various works 72,952,000 lbs. fine copper, rendering this concern one of the most important copper producers of the globe. As the management is highly skillful and aggressive, and the best technical and business talent is engaged, regardless of cost, it is obvious that the American Smelting & Refining Co. will become an increasingly important factor in the world's copper trade.

AMERICAN ZINC EXTRACTION CO.

ARIZONA.

Mine office: Tucson, Pima Co., Ariz. Lands include the San Xavier mine, carrying ores of silver, lead and copper. Has steam power. Idle.

SOCIEDAD MINERA LA AMISTAD.

SPAIN.

Office: San Antonio, 44, Granada, Spain. Mine office: Albuñuelas, Granada, Spain. Don Joaquín Marín Robles, president. Property is the Santa Inés mine, carrying copper and cobalt ores.

ANNAN-CRAWFORD MINES.

ALASKA.

Mine office: Valdez, Alaska. Said to have been purchased, late in 1905, by New York and Michigan men.

AMPARO MINING CO.

MEXICO.

Office: 815 Drexel Bldg., Philadelphia, Pa. Mine office: Etzatlán, Jalisco,

Mex. Chas. K. Smith, president; Richard J. Oellers, treasurer; John R. Williams, secretary; Ferdinand Sustersic, general manager. Organized 1902, with capitalization \$3,000,000, shares \$1 par; said to plan reduction of capital to \$2,000,000. Lands include sundry mining properties, also the Rancho Embocado, area 4,390 pertenencias. Property includes the Cañada mines, unwatered late in 1905, La Union gold-silver mine, and the San Juan, Natividad and Amparo mines, lying seven to nine miles south of Etzatlán. Principal property is the San Domingo mine, one of the earliest opened in the district, which was worked to a depth of nearly 800', ore and water being carried up 500' of ladders on the backs of peons. The San Domingo shaft is to be cut down to three-compartment size, and the mine is being opened by a new tunnel, which will give 500' of back. Shaft below the tunnel is to be equipped with pumps and hoist. Company estimates 340,000 tons of high grade milling ore on the dumps, stopes, and unbroken in the mine. Ores are highly silicious sulphides of lead, copper, silver and zinc, with good gold values, latter occasionally reaching \$40 per ton.

Equipment includes a 30-ton experimental plant, with Bryan mill, concentrating table and cyanide tank. It is planned to build a railroad from the San Domingo mine to Ahualulco, on the Mexican Central, the nearest railroad point. At close of 1905 company was milling about 30 tons daily, and shipping one car-load daily of smelting ore to Torreón. During last six months of 1905 company paid \$160,000 on note and mortgage, leaving \$70,000 total indebtedness at end of year, and began 1906 with substantial earnings, estimated by interested parties at \$100,000 monthly. Company plans beginning payment of dividends before close of 1906.

AMY C. MINE.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, owner. Ores carry gold, silver, lead and copper. Has steam power.

AMYGDALOID MINE.

MICHIGAN.

Sold, 1905, to Calumet & Hecla Mining Co.

ANACONDA CONSOLIDATED COPPER MINES AND SMELTING WORKS.

AUSTRALIA.

Property sold to Murrin Copper Mines, Ltd.

ANACONDA COPPER MINING CO.

Office: 9 Jackson Boulevard, Chicago, Ills.

ANACONDA COPPER MINING CO.

MONTANA.

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. John D. Ryan, president and general manager. Henry H. Rogers, vice-president; preceding officers, A. C. Burrage, Wm. Rockefeller, Wm. G. Rockefeller, E. C. Bogert and W. W. Dixon, directors; C. F. Kelley, secretary; A. H. Melin, assistant secretary; John Gillie, general superintendent; E. P. Mathewson, mill and smelter superintendent; D. W. Brunton, consulting engineer; J. P. O'Neill and James Higgins, mine superintendents.

Is controlled, through ownership of majority of stock, by the Amalgamated Copper Co. Organized June 18, 1895, under laws of Montana, with capitalization \$30,000,000, shares \$25 par, as successor of the Anaconda Mining Co., a

close corporation that formerly owned the mine, and which was controlled by Jas. B. Haggin, the late Marcus Daly and Senator Hearst. Annual meeting in May. Transfer agent, National City Bank, New York. Stock is listed on the London, Boston, New York and New York Consolidated stock exchanges. Dividend coupons are payable in England by the London Joint Stock Bank, Ltd., Princes Street, E. C. Warrants to bearer issued in denominations of 5, 20 and 50 shares. Dividends were \$4,800,000 in 1900; \$3,900,000 in 1901; \$1,200,000 each in 1902, 1903 and 1904, and \$2,400,000 in 1905. Total dividends of present company, for 10½ years to end of 1905, were \$21,600,000. Net earnings for 1905 were nearly \$5,000,000 from the mine, and nearly \$6,000,000, including all miscellaneous net revenues. Company closed 1905 with a surplus probably exceeding \$10,000,000, and possibly reaching \$12,000,000, presumably in cash or its equivalent.

The Anaconda is the largest copper producer of the world and employs about 5,000 men, under normal conditions.

The Anaconda mine was opened as a silver property in 1880. At a depth of about 150' the silver values decreased, being succeeded a little lower down by high grade copper ores, mainly chalcocite and bornite. At depth there is considerable enargite. The immense earnings of the mine during the fifteen years 1890-1894, are unknown, but may be estimated safely as not less than \$50,000,000.

Lands, 572 acres, being much the largest property in the Butte camp, and including, in addition to working mines, a considerable number of idle properties, and a vast acreage of undeveloped lands of prospective value. The company has nearly 400 acres between the Anaconda mine proper and the North Butte, which bids fair to prove immensely valuable. Miscellaneous real estate holdings include sundry timber lands and coal mines.

The country rock, known as the Butte granite, is basic, with an intrusive acid rock known as the Bluebird granite, a quartz-porphphy being the third rock of the series in age, the entire rock mass being shattered by fissures carrying argentiferous and auriferous copper ores. The ores are mainly sulphide, largely chalcocite and bornite, with some chalcopyrite and a large percentage of enargite, the ores having a gangue of quartzite and decomposed country rock. The oxide and carbonate ores usually found near surface in copper mines are not frequent in the Butte district, the granitic country rock being unfavorable to their formation. Like the veins of all other known mining fields, the Butte ores have grown leaner with depth, but the lowest openings show ore bodies of great persistence and strength, carrying enormous quantities of disseminated ores running 2% to 6% in copper, and high grade chalcocite was found in a big vein at a depth of 2,100' in 1905. Sufficient medium and low-grade ore is developed to enable the Anaconda to produce 75,000,000 to 100,000,000 pounds of refined copper annually for many years to come. A considerable number of stopes of high-grade ore remain untouched. Ores smelted give an average return of about 65 lbs. of copper per short ton, or 3.25% copper, with 3 oz. silver and average values of \$1.75 to \$2 gold and silver per ton.

The Anaconda mine proper employs about 700 men, and has a 3-com-

partment main shaft 2,450' deep, timbered with 10x10" square sets, with good ventilation and about 30 exits, connected underground with the Never Sweat, St. Lawrence and Bell mines. The mine has electric lights and electric signal bells. Hoisting is by 8-ton skips swung under double-deck cages and worked in counterbalance.

The Never Sweat mine employs about 500 men, and has a 3-compartment 2,440' main shaft, retimbered 1905 with false sets, allowing 18" play for squeeze. Square-set timbering is used, with back-filling. Trammings is done by horses. Mine has electric bells and lights and is connected underground with the Parrot, Colusa-Parrot and Moonlight mines. Hoist has 30x72" cylinders, of 3,000-h. p., and raises 8-ton skips swung under double-deck cages.

The St. Lawrence mine employs about 500 men and has a 3-compartment 2,400' main shaft, connected underground with the Mountain View, Pennsylvania, Anaconda, and Never Sweat mines, with 22 exits. Has a chain system of endless-haulage on the 14th level, and is equipped with electric signal bells and electric lights. The St. Lawrence mine has been on fire since 1890. This fire is in an extensive area above the 300' level, and is fought constantly, and to retard its spreading, solid masonry bulkheads are built to cut off its progress. A complete fire-fighting brigade is kept constantly on duty, working regular 8-hour shifts. The mine water of the St. Lawrence carries 9 to 13 lbs. copper per ton, and part of the copper contents are precipitated underground on scrap-iron, in concrete sumps, and the water is again leached on surface, which it reaches carrying only 2 to 4 lbs. of copper per ton. The hoist has 32x72" cylinders, raising 9-ton skips swung under double-deck cages.

The High Ore mine employs about 250 men and has a 3-compartment main shaft 2,300' deep. This mine has 7 powerful pumps, 3 stationed on the 1,000' level, 2 on the 1,600' level, and 2 on the 2,300' level, latter caring for the bulk of water from the Anaconda, Parrot and Washoe mines. Capacity of the High Ore pumping plant is equal to raising 4,000 gallons per minute from a half-mile depth. Water from the High Ore pumps goes to a big precipitating plant in the gulch back of Meaderville.

The Diamond mine employs about 250 men, and has a 2,200' main shaft.

The Mountain Consolidated mine employs about 200 men, and has a 2,200' main shaft.

The Green Mountain mine employs about 200 men, and has a 2,200' 3-compartment main shaft.

The Bell employs about 350 men and has a 3-compartment main shaft 1,600' deep, connected underground with the Anaconda. Ore is trammed by mules. Hoist is 28x40", and raises double-deck cages.

The Sunny-side, Wild Bill, Gallatin, Buffalo, and Wake-up-Jim are among the smaller mines operated by the company. The Modoc mine, which is idle, has millions of tons of 1.5% to 2% copper ore, which cannot be worked profitably at present, but which doubtless will be utilized within the next few decades.

Electric power is used extensively. The generating plant is at Canyon Ferry, 70 miles distant, and the current is wired to the mine with a primary voltage of 50,000, reduced to 2,000 volts at the transformer station, just outside of Butte, power being distributed to the various shafts and buildings from a main station at the Never Sweat. The principal dynamo is of 800-h. p., and drives a large duplex air-compressor. A three-phase dynamo, driven by the Canyon City current, furnishes the motive power for a direct-current generator that replaced an extensive underground haulage plant actuated by compressed air. Many electric lights are used underground, being employed wherever possible. A large number of minor motors at the various buildings of the surface plant are driven electrically, using a 440-volt current. At the Never Sweat is a large compressor plant, with 5 Ingersoll-Sergeant air-compressors, actuated by steam and electric power, having a combined capacity to run 360 power drills.

Although title to the reduction plant stands in the name of the Washoe Copper Co., it is described at length in this article on the Anaconda, because it treats mainly Anaconda ores, is commonly known as the Anaconda smelter, and is leased by the Anaconda company. This monstrous plant occupies a site of 225 acres on Washoe Heights, in the outskirts of the city of Anaconda, 35 miles by rail from the mines, and was planned by Frank Klepetko, and built and equipped with the able assistance of Messrs. Repath and Gulberg, and the late Messrs. R. G. Collins and Wm. F. Evans. Ground was broken May, 1900, and smelting begun February, 1902. The plant has an actual capacity of nearly 10,000 tons of raw ore daily, and has no peer in the world. Its monstrous size is shown by the material required in its construction, this including 20,000 tons of structural steel, 50,000 cubic yards of masonry, 25,000,000 feet of lumber and 1,000 carloads of brick, in addition to 300,000 cubic yards of excavation.

The concentrator covers 7 acres and is built on stone foundations, in two parts, each 255x355', connected by a power-house between. Each part contains 4 complete sections, and a description of one section gives a description of the entire concentrating plant, when multiplied by eight. Each section has one 24x24" Blake crusher, reducing ore to 3" size, this passing over two sets of trommels for sizing, oversize material going through two 5x15" crushers, which reduce it to 1½" size. Two belt elevators take the material on the main sizing-floor to a series of trommels for coarse sizing, oversize going to coarse jigs, which produce coarse concentrates for the blast-furnaces. The waste from the coarse jigs goes to two sets of 15x40" rolls for crushing, and is thence elevated and rejigged. In the jigging department all undersize material from the crushers is treated automatically. Each jigging section has 36 double Evans jigs, set in three double rows, with Evans hydraulic classifiers, making three sizes of concentrates, which go to the storage bins, while the middlings go to the middlings department, which has two sets of 15x40" rolls, crushing material to about 1¼" size, which goes by belt elevators to 4 sets of trommels, from which the undersize goes automatically to 4 hydraulic classifiers which feed 18 double Evans jigs, set in

a triple row. The process is the same as in the jigging department and the concentrates from the middling department are mixed with the concentrates from the jigging department and go thence to storage bins. The middlings are collected in launders and taken by elevators to the regrinding department, which has four 5' Huntington mills, 18 double Evans jigs and 4 hydraulic classifiers. The Huntington mills are fed from V-shaped tanks, the ground material passing through $1\frac{1}{4}$ " screens to hydraulic classifiers, thence to the jigs, both concentrates and tailings being carried by water in launders and elevators. The slimes department has 35 Wilfley tables, fed from the bottom of V-shaped tanks, concentrates going to storage bins, 24x650' and 70' high, in two sets of upper and lower bins. The concentrator also is supplied with slum ponds, and a Lake Superior steam stamp is being installed for treating certain grades of ore. The Anaconda's concentrating ore carries an average of 4% copper, 1 oz. to 6 oz. silver and 0.01 oz. to 0.02 oz. gold, 16% iron oxide, 17% sulphur and 55% silica. The tailings carry an average of 0.8% copper and 90% silica.

The sampling mills, 42x60' and 5 stories high, are of brick and wood, in 2 double sections, with a daily capacity of 600 tons each, equipped with Brunton samplers giving a final sampling of 3.2 pounds from each short ton of ore.

The roasting department is of steel, on stone foundations, 98x320', with a height of 50' from ground floor to calcining floor. This building contains 88 McDougall calcining furnaces, each 28' high and with 6 roasting hearths and 3 platforms, hopper-cars delivering concentrates to hoppers with automatic feeds, each roaster having a daily capacity of about 40 tons. No coke is required except for the preliminary heating, the sulphur furnishing all fuel required after the charge is thoroughly ignited. Each furnace has an automatic discharge into two storage hoppers, these keeping the calcined ores hot until taken out to reverberatory furnaces. The building has sheet-iron flues that take the fumes into a dust-chamber 40x300' and 40' high, this having concrete inner walls and a floor of steel hoppers.

The power-house of the concentrator plant, 136x150', standing between and connecting the two halves of the concentrator building proper, is of steel, with brick walls, having three 15-ton traveling cranes of 44' span; and contains a 500-h. p. Allis-Chalmers engine and two triple expansion 2,000-h. p. Nordberg engines, the latter using rope transmission. The boiler-room contains ten 300-h. p. Stirling water-tube boilers, heated by waste gases from the reverberatory furnaces, effecting a very large fuel saving.

The electric plant includes two 700-kilowatt 2-phase Westinghouse generators, one 500 kilowatt generator and three 125-arc-light generators, the latter furnishing light for the city of Anaconda as well as for the plant. It is planned to take power, before the close of 1906, from the Missouri river, near Helena, nearly 100 miles distant. The new plant will include a dam near Helena, and four 40-ton induction motors, to transmit a current of 70,000 volts. The new installation will cost approximately \$500,000.

The reverberatory furnace building is of steel, 184x518', and contain

28 furnaces, each 24x54', set in two rows. Each furnace, of 120 tons daily capacity, has five charging hoppers, and one coal-hopper, fed from hopper-cars, the feeding of both fuel and calcined ore being strictly automatic. The matte is drawn off into 20-ton ladle cars and taken to the converter. The slag is skimmed into boxes overflowing into running water, and the granulated slag is washed through launders to the slag-dump. Fumes from the reverberatories are taken through underground flues, one for each row of furnaces, to the main flue. Fines are no longer reduced in blast furnaces, which smelt coarse ores only. Neither is flue-dust briquetted, but is treated in reverberatories with fines, and the waste gases used for steaming purposes. This plan adds about one-third to the normal smelting capacity of the blast furnaces, and reduces fuel charges nearly or quite one-third.

The blast furnace department is a 3-story steel building, 82x200', the first floor carrying the railroad tracks, while the second story is the main operating floor, and the third is the charging floor. There were five furnaces, each 56x180' and 40' high, with a daily capacity of 400 tons each, but the largest furnace on record has been made by adding a new section between two of these furnaces, making one new furnace 56x500'. The capacity of the new furnace is about 1,600 tons daily, an increase of 300% in capacity with an increase of only 177% in size. Cupolas are made of cast iron plates, bolted, with 12 special water-jackets hung from steel beams, each furnace having 32 five-inch tuyeres. The charging floor has railroad tracks on each side of the furnaces, side-dumping hopper-cars being handled by compressed-air locomotives. The charging doors of the furnace extend full length, and are opened and closed by compressed-air pistons, and all charges are fed automatically. In front of each furnace is a 16' settler, receiving a continuous flow of molten matte and slag, the matte being drawn from the bottom into 20-ton ladle cars, and taken thence to the converters. The slag overflows into sluices and after granulation by water is washed to the slag-dumps. Overhead sheet-iron flues carry off fumes and smoke into a dust-chamber which is an exact duplicate of that in the calcining department. The product of the first fusion is a 44% matte, and the slags carry an average of 0.2% copper only.

The converter building is 137x416', of steel, with two 60-ton electric traveling cranes of 60' span each, for handling converters and ladles, and two smaller electric traveling cranes for the converting and casting departments. There are 2 reverberatory storage furnaces for the receipt of matte from blast furnaces, these being available for smelting, if desired. There are 8 stands of converters, each shell being 8' in diameter and 13' long, with eighteen 1¼" tuyeres and ball-closing valves. There are devices for tilting the shells in stands, and cranes for handling them when out of stands. The converters blow off into hoods with flues leading to a dust-chamber similar to those already described. The matte is blown up to a low-grade blister copper, and poured into ladles carried by cranes to three 70-ton casting-furnaces, which turn out anodes assaying about 97% copper and 80 oz. silver per ton. The anode moulds are on traveling carriages, actuated by hydraulic power, pigs going automatically to water-cooling tanks, while the slag goes to a casting machine and is made into

slag-brick. The lining department has a full outfit of machinery, largely automatic, for mixing linings for the converters, and these linings are tamped into place by ingenious machinery especially devised for the purpose. In 1904 low-grade silicious ore was substituted for barren silica in converter linings, effecting a saving estimated at \$600 per day, or about \$180,000 per annum.

The briquetting department has two 100-ton presses, with dryers and conveyors, but the only material now briquetted is slimes.

Blister copper from the Washoe smelter is sent east for electrolytic refining, and makes a product assaying 99.5% copper, with traces only of arsenic and antimony, notwithstanding the large quantities of these deleterious elements originally associated with the copper in the ore.

The power-house of the smelting department, 80x500', of steel and brick, has a 15-ton electric traveling crane of 500' reach. The boiler-house has eighteen 300-h. p. Stirling boilers and about 4,000 h. p. is generated from the waste gases of the reverberatory furnaces, effecting an enormous saving in fuel costs and stoking charges. There is a Nordberg triple expansion engine, with capacity to compress 20,000 cubic feet of free air per minute to a pressure of 13 pounds per square inch, also 4 Nordberg compound engines direct-connected with Connersville blowers having capacity to compress 30,000 cubic feet of free air per minute, delivered to the blast furnaces at a pressure of 2 pounds per square inch. There also are 3 smaller compressors, for locomotives and air-lifts. The plant is served by compressed air locomotives, charged at an initial pressure of 900 lbs. per square inch.

The smelter formerly discharged into the air daily about 2 tons of arsenic and scores of tons of sulphur, causing much trouble to the ranchers in the Deer Lodge valley. The Anaconda paid damages exceeding \$150,000 in settling 130 cases, and to obviate depopulating this fertile valley erected a new flue and smokestack in 1903. This stack, 300' high, has an inside diameter of 33' 4" at the bottom and 30' at the top, built of 3,000,000 brick, and is 4' 6" thick at the bottom. Connecting the smelter and stack is a flue 60' wide and 36' high, 2,170' in length, and 5,500' long with connections, under which is a tunnel 7' high and 55' wide. The trouble from arsenical sulphur fumes, while not absolutely overcome, has been greatly mitigated by the new flue and stack, and incidentally the improvement has proven an excellent thing for the company, about 175 tons of flue-dust being secured daily, of which about 60 tons are treated in a special arsenic refinery, the residue being re-smelted after the extraction of its arsenical contents. As the waste fumes from the big stack carry off enough sulphur to make about 2,000 tons of H_2SO_4 daily, a sulphuric acid plant would seem to be a logical addition to this, the world's largest and most perfect metallurgical plant. Despite the efforts of the Anaconda to cease injuring the ranchers, suits for damages continue. There is good reason for thinking that this has become an established industry, but the courts are justly refusing to award big damages to ranchers who can prove no particular injuries, and whose markets—and excellent markets at that—are made by the works of the company they are endeavoring to extort tribute from. The Anaconda is not

the only American copper mining corporation that has been systematically bled, by alleged agriculturists and ranchers.

The copper refinery of the Washoe plant was closed August, 1903, since which time all refining has been done on the Atlantic seaboard, by the Baltimore Smelting & Refining Co. The Washoe plant, in addition to Anaconda ores, now treats the production of the Parrott, Butte & Boston, Washoe and Trenton companies of the Amalgamated Copper Co., and also handles the large tonnage of the North Butte, and in April, 1906, was treating nearly 10,000 tons of raw ore daily.

The Anaconda company operates a coal mine at Belt, Cascade county, Montana, F. W. C. Whyte, superintendent, which employs about 350 men. The company also owns a controlling interest in the Butte, Anaconda & Pacific Railroad, 35 miles in length, and operates a sawmill and other extensive enterprises subsidiary to the mining and smelting of copper, among these being a big brickyard at Anaconda, which turns out enormous quantities of building, silica and fire-clay bricks, for the company's use.

For many years, with the exceptions of 1904 and 1905, the Anaconda has been the world's largest producer of copper, and the second largest producer of silver. For the Montana mining year ending June 1, 1905, the Anaconda reduced 1,473,644, short tons of ore, the largest tonnage on record, securing an average of \$9.36 per ton therefrom, the smallest returns on record. Gross income was \$13,787,343, and net earnings aggregated \$2,259,694, an average of but \$1.53 per ton of ore treated, equal to 2.35 cents per pound of fine copper. But for the advantage of the new Washoe works, the Anaconda profit would have been only one-third the amount actually realized. The savings effected by the Washoe plant may be estimated safely at \$1.25 per ton of ore treated, equivalent to but a trifle less than 2 cents per pound of fine copper produced.

For the calendar year 1905, Anaconda's production of ore was practically 95,000,000 lbs. fine copper. The management of the Anaconda is good, and the property is being handled intelligently and successfully.

ANACONDA MINE.

Mine office: San Pedro, Santa Fé Co., N. M. Carruthers & Field, owners and managers. Ores carry gold, silver, lead, copper and zinc. Has steam power and is said to have a small smelter. Presumably idle.

ANACONDA MINING CO.

Parent of the Anaconda Copper Mining Co., and still in existence.

ANACONDA PROPRIETARY COPPER, GOLD & SILVER MINE.

Succeeded by Melrose Copper Mines.

ANACONDA-SONORA COPPER CO.

Office: 159 La Salle St., Chicago, Ills. Mine office: Sahuaripa, Sonora, Mex. Employs 37 men. Ira McCord, president; Chas. F. DeWitt, vice-president; Wm. S. Barbee, secretary and treasurer; Jacob J. Smith, general manager; preceding officers and John L. Zachrias, directors; Wm. A. Morley, mill superintendent; Chas. Smith, smelter superintendent. Organized Mar. 17, 1906,

NEW MEXICO.

MONTANA.

AUSTRALIA.

MEXICO.

under laws of South Dakota, with capitalization \$3,000,000, shares \$10 par. Lands, 40 hectares, also a 40-hectarea millsite and about 1,000 hectares timber lands. Mining tract shows two ore bodies, said by company to range 8' to 90' in width and to show native copper, carbonates, chalcocite and chalcopyrite, averaging 17.5% copper, 19 oz. silver and \$3.20 gold per ton. Development is by a number of short tunnels, aggregating 756', estimated by company to give 100,000 tons of ore blocked out for stoping, which is impossible. Company reports a smelter in process of construction, on the Yaqui river, 9 miles from mine, to have two 60-ton water-jacket blast-furnaces. A branch of the Southern Pacific from Guaymas will pass within 9 miles of the property, and a wagon road is to be built between the smelter and the mine. It is also planned to develop water-power on the Yaqui river, and to construct an electric tram from the river to the mine.

ANCHORIA COPPER MINING CO.**WYOMING.**

Office: care of H. O. Granberg, secretary-treasurer, Oshkosh, Wis. Mine office: Copperton, Carbon Co., Wyo. Employs 8 men. D. H. Craig, president; E. M. Sanders, superintendent; Frank Earle, consulting engineer, Organized April, 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, area 82 acres, patented, in the Battle Lake district, developed by a 200' shaft and tunnels of 45' and 60', showing an ore body estimated at 45' width, giving average assays of 17% copper and from a trace to \$5 gold per ton. Has a 40-h. p. steam plant, with hoist good for 500', 3 power drills and 4 substantial mine buildings, of logs. A 250-ton smelter is planned to be built near the Anchoria by the Stemp Springs Coal & Power Co.

ANDERSON GROUP.**CALIFORNIA.**

Anderson & Co., owners. A group of 26 claims, with vein 2' to 6' wide, carrying argentiferous copper ore, in Riverside county, California.

ANDERSON MINING CO.**BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. J. C. Anderson, president. Has steam power and limited mining development. Idle.

ANDES COPPER MINING & EXPLORATION CO., LTD.**CHILE.**

Offices: 4, Sun Court, Cornhill, London, E. C., Eng. Wm. B. Brodrick, chairman; W. E. Singer, secretary. Capitalization £100,000, shares £1 par, issued, 6,707 shares, 10s. paid. Property is sundry mining lands in Tarapacá, Chile. Idle.

SOCIEDAD BENEFICIADORA DE MINERALES ANDINA.**PERÚ.**

Mine office: Yauli, Junin, Perú. Has silver-copper ores.

MINA ANDUEZA.**ARGENTINA.**

Owned by Sociedad Francesca de Minas y Fundicion de Nonogasta.

ANGANG COPPER CO.**MEXICO.**

Mine office: Chirangangueo, Zitacuaro, Michoacán, Mexico. Stock issue supposedly owned by Arimex Copper Co., a short-winded promotion by Thomas W. Lawson. Has a large body of medium-grade chalcopyrite, with a limited amount of development. Idle.

COMPANIA METALURGICA DE ANGANGUEO.

MEXICO.

Works office: Angangueo, Michoacán, Mexico. Early in 1906 was completing the erection of a smelter, and was developing mines leased of the Michoacán Railway & Mining Co.

ANGEL MINING CO.

ARIZONA.

Dead. Property has passed to Arizona Gold & Copper Mines Co.

ANGLO-AMERICAN COPPER CO., LTD.

Offices: 21, Ironmonger Lane, London, E. C., Eng. C. E. L. Norris, secretary. Organized Jan. 21, 1905, with capitalization £100, shares £1 par. Debentures, £10,000 authorized, £2,000 issued

ANGLO-AMERICAN COPPER MINING COMPANY

ONTARIO.

OF PARRY SOUND, LTD.

Office: 211 State St., Chicago, Ills. Mine office: Parry Sound, Ontario. Isaac Block, president; Jacob Newman, Jr., secretary and treasurer. Organized 1900, under laws of Ontario, with capitalization \$3,000,000, shares \$1 par. Lands are on Wilcox Island, near Parry Sound, showing veins carrying copper, silver, gold, cobalt and zinc, rendering the ore exceedingly refractory. Company estimates average ore values at 20% copper and 10 oz. gold per ton, which, of course, is untrue. Has one shaft, 125' deep. Mine could be operated opencast. Idle for several years.

ANGLO-AMERICAN GOLD & COPPER CO.

MEXICO.

Dead, but not buried. Lost its lands.

ANGLO-AMERICAN MINING & MILLING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Montana. Chas. F. Jones, manager. Organized, 1905, by negro residents of New York and Montana. Lands, 5 claims, in the northwestern part of the Butte camp, also sundry claims in Madison county, Montana.

ANGLO-CHILI CONCESSIONS, LTD.

CHILE.

Offices: Broad Street House, London, E. C., Eng. T. Wilson, secretary. Capitalization £15,000, shares £1 par; issued, £5,250. Is said to have mining concessions in Chile.

ANGLO-CHILIAN EXPLORATION CO., LTD.

CHILE.

In voluntary liquidation, August, 1905.

ANGLO-ITALIAN COPPER SYNDICATE.

ITALY.

Said to hold 12,000 acres of copper-bearing land near Genoa, Italy.

ANGLO-ROUMANIAN FINANCE & TRADING CO., LTD.

ROUMANIA.

Dissolved, August, 1904.

ANGLO-WESTPHALIAN COPPER CO., LTD.

GERMANY.

Offices: 1, Great Winchester St., London, E. C., Eng. A. W. Johanning, secretary. Organized August 29, 1904, with capitalization £1,000,000, shares £1 par. Property includes the Kampf mine, area 84.7 hectares, also the Gottesegen and Gottesgabe concessions, area 874 hectares, in Rhenish Prussia.

ANGUS COPPER MINING & MILLING CO.

Office: 10 North Eighth St., St. Louis, Mo. Location of property, if any, unknown.

ANI GROUP.

Owned by the Furukawa Mining Co.

JAPAN.**MINA LAS ANIMAS.****MEXICO.**

Office: care of P. Sandoval y Ca., Nogales, Sonora, Mexico. Mine office: Santa Ana, Sonora, Mex. Ores carry gold, silver, copper and lead. Main shaft, 400'. Has steam power and a 40-ton smelter, employing circa about 25 men, at last accounts.

ANITA CONSOLIDATED COPPER CO.**ARIZONA.**

Reorganized, 1903, as Anita Copper Co.

ANITA COPPER CO.**ARIZONA.**

Office: 224 Milk St., Boston, Mass. Mine office: Williams, Coconino Co., Ariz. C. O. Brightman, president; Henry I. Nesmith, secretary; Paul Whitin Abbott, treasurer; John M. Cameron, superintendent. Organized, August, 1903, under laws of Arizona, with capitalization \$5,000,000, shares \$5. Beacon Trust Co., Boston, registrar. Lands, 50 claims, area 1,000 acres, surveyed for patents, lying on both sides of the Bright Angel branch of the Santa Fé railway, also a 160-acre millsite and 60 acres miscellaneous lands, giving total holdings of 1,220 acres, all in the Francis mining district. Country rocks are carboniferous limestone, supposedly about 800' in thickness, showing carrying three known ore bodies, apparently lenses, of which one is undergoing development, this giving oxide and carbonate ores assaying 8% to 15% copper and 3 oz. to 4 oz. silver per ton, with a trace of gold, opened by shafts of 103', 93', 40', 35' and 580', and by several hundred feet of short tunnels. Mine has a 10x14" Fairbanks & Morse gasoline hoist, good for depth of 2,000', a 12-drill Rand air-compressor and 8 power drills. Smelter, at Williams, 47 miles from mine, with all-rail communication, has a 100-ton water-jacket blast-furnace, with other necessary machinery for a 200-ton smelter.

ANITA COPPER MINES CO., S. A.**MEXICO.**

Mexican corporation of the Douglas Copper Co.

ANITA MINING CO.**MEXICO.**

Office: 11 Wall St., New York. Letter returned unclaimed from former mine office, Bolaños, Jalisco, Mexico. Peter J. Quinn, president; R. W. Elliott, secretary; Thos. R. Warne, manager. Organized April, 1899, under laws of South Dakota, with capitalization \$500,000, shares \$1 par. Debentures, \$35,000 authorized, \$10,000 issued, at 6%. Mineral lands, 20 pertenencias, with a 20-acre millsite and 20,000 acres miscellaneous lands, in the Bolaños district. Has 3 shafts, deepest 360', also 3 tunnels, longest 600'. Property is an antigua, opened circa 1600, again worked 1849-1863, and reopened by present company in 1899. Has steam power, air-compressor, shops, and smelter 4,000' from the mine, receiving ore by tram, having a 40-ton blast furnace and 20-ton reverberatory furnace, claimed to turn out blister copper carrying 95% copper, 160 oz. silver and 6 oz. gold per ton. Nearest railroad is the Mexican Central, 140 miles distant. Smelter is idle and company experimented with a new-fangled "reduction process," which the inventor firmly expected would turn raw ore into blister copper, without fluxes, in one heat. Idle since circa 1899. Company apparently moribund.

ANNA MINE.

Letter returned unclaimed from former mine office, Providence, Yavapai Co., Ariz. Has a 15 stamp mill.

ANNANDALE MINE.

Owned by Blayney Mining & Smelting Co., at last accounts.

ANNIE MINING CO.

Office: Laramie, Wyo. Mine office: Jelm, Albany Co, Wyo. Idle. Louis Miller, president and general manager; L. A. Hancock, secretary. Organized 1903, under laws of Wyoming, with capitalization \$250,000, shares \$1 par. Lands, 2 claims, area 40 acres, in the Jelm district, said to show two 4 contact veins between granite and schist, opened by a 140' shaft and a 138' tunnel, showing azurite and bornite, assaying up to 20% copper and \$10 gold per ton. Idle since 1904.

ANTIETAM MINE.

Mine office: Metcalf, Graham Co., Ariz. Paul F. Crowley, general manager. Lands, 3 claims, opened by a 146' shaft, with drifts showing an ore body of 15' to 35' width, giving assays of 4% to 10% copper, 7 oz. silver and \$2 gold per ton, from chalcocite and chalcopyrite.

COMPANIA DE COBRES DE ANTOFAGASTA.

Office: Blanco No. 144, Valparaiso, Chile. Mine office: Chuquicamata, Antofagasta, Chile. Employs about 100 men. Federico Lesser, chairman; Edouardo I. I. Sandiford, vice-chairman; Carlos R. Harrison, secretary; Alejandro Muirhead, general manager. Organized September, 1900, under laws of Chile, with capitalization £65,000, shares £10 par. Lands, 30 claims, area 100 hectareas, also 2 kilometres of river frontage for water power. Property is served by a branch of the Bolivian Railway. Company is developing its more important properties along well-considered and practical lines, and its holdings are situated in what is considered the most valuable portion of the Chuquicamata district.

AO MINE.

Owned by the Caledonia Copper Co., Ltd.

APACHE COPPER CO.

Office: 72 Trinity Place, New York. Meyer Zulick, president. Capitalization \$2,500,000. Lands are in Yuma county, circa 25 miles east of the Colorado river and 100 miles west of Congress Junction, Arizona. Property is developed by shafts and tunnels, showing ore with good gold and silver values. Considerable ore has been mined and is on the dumps. Property is considered valuable, if given adequate transportation facilities, or a near-by smelter.

APACHE DEVELOPMENT CO.

Office: care of Martin Pattison, Superior, Wis. Mine office: Hachita, Grant Co., N. M. John E. Penberthy, superintendent. Organized 1905, under laws of Minnesota, with capitalization \$1,000,000, shares \$10 par. Lands, 23 claims, variously known as the Apache or Copper Crown group, 6 miles south of Hachita, held under bond and lease of \$100,000, \$10,000 paid. Mine has a 260' shaft, with about 3,700' of openings, said to show circa 200,000

ARIZONA.**AUSTRALIA.****WYOMING.****ARIZONA.****CHILE.****NEW CALEDONIA.****ARIZONA.****NEW MEXICO.**

tons of medium grade oxide and carbonate ore, with sulphides expected at greater depth.

APACHE & MULTNOMAH MINES.

WASHINGTON.

Mine office: Nespelem, Okanogan Co., Wash. F. O. Hudnut, superintendent, at last accounts. Ores carry gold, silver, copper and lead.

APEX COPPER CO.

COLORADO.

Office: 304 Colorado Bldg., Colorado Springs, Colo. Mine office: Hayman, Park Co., Colo. Employs 5 men. John K. Vanatta, president; J. J. O'Driscoll, vice-president and general manager; W. L. Boatright, secretary; Emil Erickson, superintendent. Organized March, 1903, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par. Lands, 9 claims, area circa 90 acres, in the Lower Tarryall district, showing two nearly vertical contact veins of 3' average width, between spar and limestone, carrying chalcopryite and bornite assaying 14% to 30% copper, 7 oz. silver and \$1.20 gold per ton, opened by 5 shafts, 2 deepest being 176' and 220', and by 4 tunnels of 250' aggregate length. Has a 90-h. p. steam plant, 7 drill Leyner air-compressor, 8x10" hoist and 24x40' engine house. Company plans deepening No. 2 shaft to 500', during 1906. Management is well regarded.

APEX GOLD MINES CO.

WASHINGTON.

Latest report by management shows no copper values, though such were claimed by preceding owners.

APEX GOLD MINING & MILLING CO.

COLORADO.

Mine office: Apex, Gilpin Co., Colo. Chas. E. Barrick, manager. Lands include the Rochester group, on Oregon Hill, opened by a 110' shaft, showing a vein of 10' to 12' width, carrying iron-copper sulphides.

APEX MINING CO.

WASHINGTON.

Succeeded, 1903, by the Apex Gold Mines Co.

APOLLO CONSOLIDATED GOLD MINING CO.

WASHINGTON.

Office: New Haven, Conn. Mine office: Republic, Ferry Co., Wash. E. J. Delbridge, general manager. Ores carry gold, silver, lead and copper. Has steam power.

APOLLO COPPER MINING & MILLING CO.

UTAH.

Letter returned unclaimed from former office and mine, Frisco, Beaver Co., Utah. Geo. A. Gilbert, president; Matilda Olsen, secretary and treasurer. Organized 1902, under laws of Utah, with capitalization \$40,000, shares 10c. par.

NESTOR ARAIZA.

MEXICO.

Office: Tepezalá, Aguascalientes, Mexico. Is said to own and operate sundry small copper properties in the vicinity of Tepezalá.

ARAKAWA MINE.

JAPAN.

Owned by the Mitsu Bishi Gossai Kwaisha.

ARAMO COPPER MINES, LTD.

SPAIN.

Offices; 2, Metal Exchange Bldgs., London, E. C., Eng. Mine office: Pola de Lena, Asturias, Spain. C. W. Aston Key, secretary. Organized, July 3, 1897, with capitalization £40,000, shares £1 par. Property is the Aramo copper and cobalt mines. Idle for some years.

ARAPAHOE GOLD & COPPER MINING CO.**COLORADO.**

Organized, circa 1899, under laws of Colorado. L. D. Longhi, president and treasurer; J. S. Riggs, secretary. Lands, 4 claims and a tunnel-site, in the Sugar Loaf district of Boulder county, Colorado. Idle since 1902, except for annual assessment work, done at the personal expense of the president.

ARBUCKLE & SCHUMAN GROUP.**ARIZONA.**

Office and mine: care of J. A. Stewart, superintendent, Clifton, Graham Co., Arizona. Lands, adjoining the Shannon on the east, have about a quarter mile of development work, showing some high-grade carbonate and sulphide ores.

ARCADIAN COPPER CO.**MICHIGAN**

Office: 24 West St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Albert C. Burrage, president; Chas. D. Burrage, secretary and treasurer; Nathan F. Leopold, general manager; Robt. H. Shields, agent; Thos. Carlyon, superintendent. Organized March 31, 1899, under laws of New Jersey, with capitalization \$3,750,000, shares \$25 par. Lands, circa 4,000 acres, including 6 old mines. Was extensively opened, 1898-1901, and equipped with magnificent buildings and machinery, including a 3-stamp mill at Gross Pointe. Operations proving unsatisfactory, all work was suspended June 15, 1903. Hoists, machinery and shafthouses were sold to the Trimountain, the mill was disposed of to the Centennial, and mine dwellings carted away, property being almost completely dismantled. The mine remained idle till October, 1905, when work was begun on an amygdaloid a quarter mile east of the Isle Royale lode, previously worked. The new lode was the most easterly drilled, about 4,000' of undrilled territory remaining between the new lode and the Eastern Sandstone. The new amygdaloid had a shaft 70' deep at close of 1905, showing promising copper values. Drifting is to begin at 200' depth. Shaft has a boiler, compressor and hoist good for 500' depth.

ARCTIC CHIEF MINE.**YUKON.**

Mine office: White Horse, Yukon, Canada. Is owned by local capital. Has shipped about 150 tons of bornite, averaging about 25% copper, to British Columbia smelters. Regarded as a promising property, but handicapped by lack of facilities for either shipping or smelting.

ARDILLA COPPER MINES, LTD.**PORTUGAL.**

Property taken possession of, 1905, by debenture-holders.

ARENILLAS COPPER MINES, LTD.**SPAIN.**

Voluntarily wound up, May 1904.

ARGENTA COPPER CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. Idle, but said, at close of 1905, to plan resumption.

ARGENTA MINES CO.**B. C.**

Office: 50 Congress St., Boston, Mass. Mine office: Argenta, via Ainsworth, Kootenay, B. C. Employs 12 men. Wm. F. Almy, president and general manager; Geo. R. Angus, secretary and treasurer; L. Hanna, superintendent; Alfred C. Gardé, engineer. Organized April, 1902, under laws of Maine, with capitalization \$2,000,000, shares \$1 par. Cash on hand at close of 1905

was \$34,217.15 Annual meeting, third Wednesday in January. Lands, 17 claims, area 550 acres, in the Ainsworth district. Formation is limestone, schist, and black slate, traversed by porphyry and trap dykes, vein occurring as a fissure in the schist, ranging 7' to 30' in width, and showing chalcocite and chalcopryrite assaying 3% to 20% copper, up to 10% lead and 7 oz. to 46 oz. silver per ton, with a trace of gold. Development is by 4 tunnels of 93', 572', 644' and 1,288' with a total of 3,051' of openings, estimated to show 150,000 tons of ore. Company has developed 300 h. p. from a waterfall of several thousand horse power available. Has a 10-drill air-compressor and 5 power drills, with necessary mine buildings. Mine is served by the Canadian Pacific Railway, and is 5 miles from Nelson, connected therewith by wagon road, built by the government. Development of property seems along sensible lines, and property is considered promising.

ARGENTINA-TIERRA DEL FUEGO EXPLORATION CO.

Office: care of Banco de Italia, Buenos Ayres, Argentina. Organized 1905, with capitalization £1,000,000.

ARGHANA MADEN MINES.

TURKEY.

Office: care of Imperial Minister of Forests & Mines, Constantinople, Turkey. Mine office: Arghana Maden, Turkey. Property is owned and operated by the Turkish crown. Mine is opened by adits and has been operated for nearly 300 years. Ore averages about 12% copper, and is smelted in a primitive manner, with charcoal, which is scarce at the mine, and the product, amounting to the equivalent of about 2,500 metric tons fine copper annually, is shipped as a 50% to 60% matte, on camel-back, to Tokat, or the coast. Production is hampered by lack of transportation facilities. Mine workmen are paid in food, clothing and tobacco, and the mining practice is very much behind the times, in all respects.

ARGO COPPER MINING CO.

MONTANA.

Merged, March 7, 1901, in Eclipse-Argo Mining Co.

**ARGO MINING, DRAINAGE, TRANSPORTATION
& TUNNEL CO.**

COLORADO.

Succeeded by Argo Tunnel & Mining Co., Ltd.

ARGOLIS COPPER MINING SYNDICATE, LTD.

GREECE.

Offices: 19, Eastcheap, London, E. C., Eng. H. H. Waller, secretary. Organized March 1, 1904, with capitalization £5,000, shares £1 par; issued £2,025. Property is a 25-year lease, expiring December, 1929, of 854.4 hectares near Nauplia piada, district of Epidaurus, Greece, at a rental royalty of 4s. per ton on ore produced.

ARGO TUNNEL & MINING CO., LTD.

COLORADO.

Offices: 3, Great Winchester St., London, E. C., Eng. Mine office: Idaho Springs, Clear Creek Co., Colo. F. Hargreaves, chairman; Joseph C. E. Gillham, secretary; Lafayette Hanchett, superintendent. Organized March 10, 1899, as a reconstruction of the Newhouse Tunnel Co., Ltd., with capitalization £350,000, shares £1 par; issued, £300,000. Development is by a tunnel of 13,138', which is perhaps the longest mining tunnel in existence, and is proving one of the few really successful mining and drainage tunnels, among the

many planned and begun. Ores carry gold, silver, lead and copper. Has steam and electric power.

ARGYLE MINING CO., LTD.

ARIZONA.

Offices: 194, St. Vincent St., Glasgow, Scotland. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. A. Mitchell, secretary. Organized December 29, 1900, with capitalization £100,000, shares £1 par; issued, £65,007. Lands, 2 claims, area 40 acres, known as the Examiner and Mineral Hill, near Huron, Yavapai county, Arizona. Idle for several years.

ARIMEX CONSOLIDATED COPPER CO.

ARIZONA & MEXICO.

Office: 85 Ames Bldg., Boston, Mass. Chas. H. Dickey, president; C. D. Burrage, secretary. Organized under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par. Property includes the Copper Prince group of 30 claims, in the Silver Bell district, Pima county, Arizona, held through Oxide Copper Co.; seven-eighths of the stock of the Table Mountain Copper Co., which has 27 claims in the Bunker Hill Mining district of Pinal county, Arizona, and nine-tenths of the stock issue of the Angang Copper Co., which holds about 400 pertenencias, known as the Chirangangueo mines, near Zitacuaro, Michoacán, Mexico. Neither of the Arizona properties is of apparent promise, but the Mexican claims might be of some value, if properly developed. The Arimex Consolidated Copper Co. was promoted by Thomas W. Lawson, and, like his other copper mining companies, apparently is merely a stock-jobbing scheme.

ARIZONA & ARKANSAS LEAD, ZINC & COPPER MINING CO.

ARIZONA & ARKANSAS.

Letters returned unclaimed from former office, 208 Tajo Bldg., Los Angeles, Cal., and from former mine office, Gila Bend, Maricopa Co., Ariz. Described in Vol. V.

ARIZONA BANNER COPPER CO.

ARIZONA.

Office: 1103 Fullerton Bldg., St. Louis, Mo. Mine office: Globe, Gila Co., Ariz. Chas. W. Slack, superintendent. Organized 1905, as a reconstruction of the Pinal Copper Co. Lands, 160 acres, known as the Black Copper group, 8 miles northwest of Globe, developed by 10 shafts and tunnels, and claimed to have 20,000 tons of 10% to 15% ore in sight. Idle since 1901.

ARIZONA BELLE MINING CO.

ARIZONA.

Organized Feb. 20, 1906, at Tucson, Arizona, by 8 shareholders of the Virginia Belle Gold & Copper Mining Co., apparently to take the lands formerly held by latter company.

ARIZONA BLUE BELL COPPER CO.

ARIZONA.

Presumably dead, as Blue Bell mine has passed to Arizona Exploration Co.

ARIZONA CENTRAL COPPER CO.

ARIZONA.

Letter returned unclaimed from former office, Prescott, Ariz. Mine office: Williams, Coconino Co., Ariz. J. F. Wilson, president; J. M. Elder, secretary.

ARIZONA COLORADO COPPER BELT & GOLD

ARIZONA.

MINING & MILLING CO.

Office: 305 State Life Bldg., Indianapolis, Ind. Mine office: Globe, Gila

Co., Ariz. Hon. Robert M. Foree, president and general manager; Chas. H. Trotter, secretary; C. Fenger, treasurer; J. Bandhauer, superintendent. Organized September, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands, 18 claims, area 370 acres, adjoining the Old Dominion on the southwest, showing veins ranging from 3' to 100' in width, carrying auriferous and argentiferous oxide and carbonate ores, assaying 8% to 30% copper, 20% to 50% lead, 1 oz. to 200 oz. silver and \$3 to \$30 gold per ton. Has 7 pits and shafts, main shaft 400', and tunnels of 10' to 200' length. Is sinking three shafts, and it is planned to crosscut at 500' depth.

ARIZONA COMMERCIAL CO.

ARIZONA.

Succeeded, 1904, by Arizona Commercial Copper Co.

ARIZONA COMMERCIAL COPPER CO.

ARIZONA.

Office: 11 Pine St., New York. Mine office: Globe, Gila Co., Ariz. N. L. Amster, president; F. B. Close, consulting engineer; W. S. Sultan, superintendent; N. L. Amster, Chas. H. Paine, R. T. McKeever, Robert W. Emmons, Alex. B. Clough and Sigourney W. Fay, directors; American Loan & Trust Co., Boston, transfer agent. Organized, January, 1905, under laws of Maine, with capitalization \$2,500,000, shares \$25 par. Of the stock issue, \$1,000,000 was given the Arizona Commercial Co., and \$1,000,000 to the Metamora company, for their respective properties, retaining \$500,000 in the treasury for working capital. In December, 1905, company had \$62,191 cash on hand.

Lands lie just north of the Old Dominion and adjoin the United Globe, principal properties being the Copper Hill and Black Hawk mines. The Copper Hill has a 600' two-compartment shaft, to be deepened to 800', equipped with a new hoist and air-compressor. This shows sulphide ores on the third, fourth, and sixth levels, the sixth level, at the bottom, showing a vein of 9' to 10' width, ranging 5% to 8% copper, with considerable covellite 10% or better in tenor. The Copper Hill mine has reserves of sulphide ore estimated at 100,000 tons, also several hundred thousand tons of silicious carbonates, at or near surface, which are mined at a cost of about 50 cents per ton, and could be won much cheaper with a steam shovel. The Copper Hill is connected underground, for ventilation and safety, with the Gray mine of the Old Dominion.

The Black Hawk mine has two shafts, deepest 265'. The surface capping is a low-grade iron ore. At surface a 45' vein of silicious ore averages about 4% copper, with excess of iron. There also is a hematite vein of 3' to 14' width, carrying 4% to 7.5% copper, with small silver values. The mine has upwards of a mile of underground openings.

Production was begun July 26, 1905, with shipments of 50 tons daily to the Old Dominion smelter, and Sept. 27, 1905, shipments were begun to the Copper Queen smelter, at Douglas. At close of 1905 mine was shipping about 50 tons daily to each smelter, and employed upwards of 100 men. It was planned to increase production to about 200 tons daily by spring. The ore smelted in 1905 gave net returns of about \$5 per ton, and company was netting about \$10,000 monthly at close of the year.

Railroad connection was secured in 1905. The Arizona Commercial is of

considerable promise, and the new management, which is composed of able and experienced copper men, is sufficiently strong financially to assure giving the mine a fair chance.

ARIZONA CONSOLIDATED COPPER MINES, LTD.

ARIZONA.

Offices: 80, Coleman St., London, E. C., Eng. W. W. Macalister, secretary. Organized June 17, 1899, with capitalization £150,000, shares £1 par. Lands, sundry claims in the Copper Mountain district of Graham county, Arizona. Apparently no work was done thereon by present company.

ARIZONA CONSOLIDATED MINING CO.

ARIZONA.

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Benson, Cochise Co., Ariz. Chas. M. Dodson, president; Garrett B. Lindermann, treasurer; Samuel D. Luckenbach, secretary; Samuel J. Entrichken, general manager; Hale McCormick, superintendent; Kempton & McCoy, consulting engineers. Organized July, 1904, under laws of Delaware, with capitalization \$1,000,000, shares \$1 par, in \$300,000 preferred and \$700,000 common stock.

Lands include the Russell mines, in the Dragoon Mountains, formerly owned by the Russell United Copper Co. Property is in two groups, known as the New Republic and Mammoth. The New Republic has a 225' two-compartment shaft, sunk at an angle of 45° with the horizon, showing a 2' vein of high-grade oxide and sulphide ore, running 7% to 12% copper, also open-cuts showing 15% ore with fair silver values. The Mammoth group has a 270' shaft, from which upwards of 1,000 tons of ore has been shipped, giving returns of 10% to 26% copper. Power is furnished by a 150-h. p. Witte gasoline engine. At close of 1905 mine was making small shipments to smelters, while pushing development. Property seems of considerable promise, and apparently has a good management.

ARIZONA COPPER CO., LTD

ARIZONA.

Offices: 29, St. Andrew Sq., Edinburg, Scotland. Mine office: Clifton, Graham Co., Ariz. Employs circa 2,000 men. John Gill, chairman; Jas. Colquhoun, general superintendent; Alex. Veitch, general manager; Wm. Exley Miller, secretary; Geo. Fraser, smelter superintendent; Archibald Morrison, mill superintendent; C. D. Clark, mechanical engineer; A. T. Thompson, mine clerk. Organized August 5, 1884, with capitalization £755,000, of which £703,984 is issued, in 160,000 "A" preference shares of 5s. par; £316,530 fully paid preference shares; £316,530 fully paid preferred ordinary shares; and £63,444 fully paid deferred shares. Profits are divided as follows: 10% cumulative dividends on "A" preference shares; cumulative 7% dividends on preference shares; 10% non-cumulative dividends on preferred ordinary shares; 10% non-cumulative dividends on deferred ordinary shares; balance, if any, to be divided pro rata between preferred ordinary and deferred ordinary shares. Debentures, £175,490 outstanding, at 5%. Fiscal year ends Sept. 30th. Dividends for fiscal year ending September 30, 1905, were £284,980, carrying forward a balance of £11,874. In addition to paying large dividends the company has expended about £600,000 in reconstruction of plant, railways, etc., since 1901. About 20% of the stock issued is held in the United States.

Lands, circa 4,000 acres, including eight producing mines, at Morenci.

Metcalf, Longfellow, Garfield and Coronado, in Graham county, Arizona. The ores average about 3.25% copper and production is about 10% smelting ore and 90% concentrating ore. The mines are developed to a depth of about 500' only, and are opened mainly by tunnels, giving cheap extraction. Notwithstanding the comparative shallowness of the properties, a tremendous amount of ore is developed, ore reserves being estimated, March, 1905, at 10,370,600 tons, "practically in sight."

The Humboldt mine, which is the largest producer, shows an enormous body of low-grade disseminated chalcocite. Extraction from this property is partly open-cast, but mainly through tunnels equipped with electric lights and electric traction. The haulage system uses the overhead trolley, power being furnished by a 146-h. p. Crossley gas engine, driving a 100-h. p. generator that furnishes a 225-volt current. Electric locomotives of 10-h. p. haul 40-ton loads the line having a single track laid with 35-lb. rails, running 600' directly through the mountain, with a loop reaching all workings of the Humboldt mine, tunnel running through International Hill direct to the new concentrator.

The Longfellow mine is the oldest important copper producer of Arizona, dating from circa 1877. A new tunnel, driven in from Chase creek, will do away with the hoisting plant and permit cheaper extraction, while opening the mine to much greater depth than heretofore. The Longfellow Extension mine is developing well.

The Metcalf group, 7 miles from Clifton, is worked open-cast and is an extensive producer of low-grade oxidized ores, which are concentrated with the sulphide ores from the Humboldt and Yavapai groups. The Coronado group, 9 miles from Clifton, has 3 new shafts, deepest 400', sunk almost entirely in ore, and the mine is showing considerable high-grade ore.

The Clay mine, which has been only a small producer in the past, is being developed to highly important dimensions, and shows a very large tonnage of low and medium grade ores.

Ore is taken from the different mines by 6 gravity tram-lines, to storage bins on the Coronado railroad, thence to the reduction plant, at Clifton, which was remodeled, 1902, and further enlarged in 1904 and 1905, and now includes six concentrators, a smelter, acid plant and leaching plant. The concentrators have a combined daily capacity of 1,700 tons, and are operated by gas and electric power. The concentrators put 6.6 tons of crude ore into one ton of concentrates, and Chase creek has been dammed, to stop the tailings going into the Frisco river, and thence into the Gila river, which formerly caused considerable damage to farmers and ranchers, and was an annoyance to all concerned. Concentrator and smelter are connected by a gravity tramway. The new 700-ton concentrator, at the Longfellow mine, was progressing rapidly at the beginning of 1906, and should be in operation during the latter half of the year. This will give a daily milling capacity of 2,400 tons or just double the capacity of 1904. A new concentrator for the Coronado mine is planned, when the new electric power installation is completed. Two Hancock jigs were installed during 1905, handling 600 tons daily and replacing 35 Frue Vanners and 2

Wilfley tables. The Hancock jigs require little water and are highly economical of floor space, these two machines replacing 45 separate machines formerly in use. Allis-Chalmers high-speed rolls have been installed for crushing, and Huntington mills for regrinding.

A complete electric power plant is planned. This will generate energy and transmit same electrically to the mines and works, from a dam about 50 miles distant.

The smelter has a steel frame, slate roof, and floor of iron plates laid in cement, being well designed and thoroughly modern. There are six 300-ton water-jacket furnaces, each 39x240' at the tuyeres, treating about 250 tons each, daily, with blast supplied by Nos. 7, 9 and 10 Connersville blowers, operated by a 270-h. p. engine. Gases from the furnace pass through a 480' tunnel and a 300' shaft, discharging 800 above the level of the town. Slag settlers of a new type are 7x14', and 3' deep, with a 6" fire-brick lining. Matte of 50% to 55% is charged into the converters by a 10-ton ladle, operated by a 30-ton electric crane. The conversion plant has 3 stands, with six 7-ton shells, having a daily capacity of 50 tons of 99.5% blister copper. Disintegration of slag by running water was tried, but has been discontinued, and molten slag again is handled in ladle cars, by a steam locomotive. A new briquetting plant, built 1905, has 25 tons capacity per 10-hour shift. Pitch is used for a binder, under 2,000 lbs. pressure per square inch. Plant is entirely automatic, fines going in at one end and briquettes being loaded upon cars at the other. The reduction plant went into commission in 1901, and is well designed and thoroughly modern throughout.

The works have an acid plant, making about 3,500 tons of sulphuric acid yearly, from the fumes of the roasters, the entire product being used in the leaching plant, which treats an average of about 250 tons of low-grade oxidized ores daily. In connection with the lixiviation works there is a 125-ton blue-stone plant, making about 3,000,000 lbs. of copper yearly. The Arizona has developed the most successful leaching plant in the United States, and its management is entitled to great credit therefor.

The mines and works use about 3,000 h. p., supplied almost equally from gas, steam and distillate engines. The company operates the Coronado railway, and fitted with 30-ton ore cars of standard gauge, for 4 miles from Clifton to Longfellow, and of 36" gauge 2.5 miles from Longfellow to Metcalf, also the Arizona & New Mexico railway, a standard-gauge line running 107 miles from Clifton to Hachita, N. M., where connections are secured with the El Paso & Southwestern. Profits of these lines were £69,173 in 1903.

Miscellaneous enterprises of the company include a well-equipped foundry, machine shop, sawmill, planing mill and 20-ton ice plant, all of brick. A good library and reading room are maintained for employes. Production was 32,197,760 lbs. fine copper in 1904, and about 26,836,000 in 1905 and should reach 35,000,000 lbs. in 1906. The property is one of great magnitude, and production can be largely increased by enlarging the already extensive plant. The company's management is excellent, both as to finances and the physical handling of the mines, mills and smelters.

ARIZONA COPPER & GOLD MINING CO.**ARIZONA.**

Letter returned unclaimed from former office, Phoenix, Ariz. Lands, sundry claims in the Harcuvar Mountains, northeastern Yuma county, developed by a 55' tunnel, showing a 5' vein of auriferous copper ore, and a 220' shaft, bottomed in a vein, apparently about 20 wide, carrying malachite and chalcopryrite. Is said to have about 1,000 tons of shipping ore on the dump.

ARIZONA COPPER HILL MINING CO.**ARIZONA.**

Office: Jackson Bldg., Denver, Colo. Mine office: Oracle, Pinal Co., Ariz. Edwin Scott, president; J. H. Edwards, secretary; Frank J. Buck superintendent. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 4 patented claims, area 65 acres, also a 5-acre millsite and 160 acres miscellaneous lands, in the Cañada del Oro district, said to show a contact vein 20' to 70' width and 4,800' length, opened by shafts of 281' and 350', and by a 350' tunnel, with 2,000' of underground openings. Is claimed to have 500,000 tons of low-grade silicate and carbonate ores developed. Has steam and gasoline power and 100-ton cyanide plant. Hubert Reynolds and other shareholders are suing officers, alleging in suit that directors voted to secure a loan of \$25,000 by mortgage, taking only 75% of face of loan in cash, and turning 35% into treasury, balance being divided as bonuses among officers.

ARIZONA COPPER MINING CO.**ARIZONA.**

Office: care of Geo. H. Parker, secretary and treasurer, Los Angeles, Cal. Mine office: Tucson, Pima Co., Ariz. E. C. Griffith, president; B. C. Brechta, superintendent. Lands, 20 claims, in the Tucson Mountains, near Tucson, slightly developed by a 400' tunnel, said to show an 8' vein carrying ore of good grade.

ARIZONA COPPER MOUNTAIN MINING CO.**ARIZONA.**

Office: care of B. T. MacMasters, secretary and treasurer, First National Bank Bldg., Chicago, Ills. Organized Jan. 25, 1901, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Lands 6 claims, area 120 acres, in process of patenting, 25 miles from a railroad, in the Copper Mountain district of Mohave county, Arizona, developed by 4 shafts, deepest 200', and a tunnel of 183', with a total circa 1,500' of underground openings, showing 5 veins of 3" to 30' width, carrying oxide and carbonate ores, with a little chalcocite, giving good assays in copper, with gold values of \$1.20 to \$8.90 per ton. Employs 3 men and plans increasing force.

ARIZONA COPPER MOUNTAIN MINING CO.**ARIZONA.**

Title changed, 1904, to Copper Butte Mines.

ARIZONA COPPER PLACER MINING & MILLING CO.**ARIZONA.**

Said to have lands near Quartzite, Yuma county, Arizona.

ARIZONA COPPER SYNDICATE.**ARIZONA.**

Letter returned unclaimed from former office, 32 Broadway, New York. Organized under laws of West Virginia. Lands were forfeited, and afterwards bought back by leading shareholders, and deeded back to company, subject to a \$7,000 mortgage, covering back taxes and cash advanced. An

effort was made, circa 1904, to reorganize under title of Clifton Copper Mines, Ltd.

ARIZONA COPPER SYNDICATE, LTD.

ARIZONA.

An English corporation. Moribund.

ARIZONA DIAMOND DRILL MINING DEVELOPMENT CO.

ARIZONA.

Office: care of Owen McAleer, Los Angeles, Cal. Officers of company are largely holders of political offices. Company's advertising is exceedingly vague and unbusinesslike.

ARIZONA & EASTERN CONSOLIDATED MINING CO.

ARIZONA.

Office: care of Maj. E. L. Delestry, general manager, St. Paul, Minn. Mine office: Globe, Gila Co., Ariz. Organized Dec., 1905, under laws of Arizona, with capitalization \$1,500,000, shares \$5 par. Lands, 6 claims, known as the Patterson group, in the Mineral Creek district, developed by a 400' tunnel. Claims are regarded favorably, but company is not.

ARIZONA & EASTERN MINES & POWER CO.

Office: 6-135 Grand Ave., Milwaukee, Wis. J. O. Buckley, president and treasurer; Henry R. Buckley, vice-president; Thos. T. Somers, secretary; Donald Ferguson, general manager and consulting engineer. Capitalization \$7,500,000, shares \$100 par. Company advertises that it wishes to purchase mining properties in Arizona or Sonora.

ARIZONA, EASTERN & MONTANA SMELTING & ORE

MONTANA.

PURCHASING CO.

A swindle, promoted by the notorious Dr. R. C. Flower.

ARIZONA EXPLORATION CO.

ARIZONA.

Mine office: Mayer, Yavapai Co., Ariz. Ernest A. Haggott, superintendent. Company is composed mainly of shareholders of the Arizona Smelting Co., which is building a new smelter at Humboldt, and also is closely connected with the De Soto Mining Co. Lands are the Blue Bell group, formerly owned by the Arizona-Blue Bell Copper Co. The Blue Bell mine is being connected with the Prescott & Eastern Railway by an aerial tram. The group of 3 claims has 3 fissure veins in Algonkian slates, with quartzite footwall and grano-diorite hanging, developed by 6 shafts, deepest 300', and by tunnels of 70' and 75', showing cuprite, malachite and chalcopyrite, all slightly argentiferous and auriferous, with a large ore body opened on the 300' level. Machinery is to be actuated by electric power, carried by a 10-mile transmission line.

ARIZONA GIANT COPPER CO.

ARIZONA.

Office: 229 Byrne Bldg., Los Angeles, Cal. Mine office: Ehrenburg, Yuma Co., Ariz. R. M. Furlong, president; H. Franklyn Hiller, secretary and treasurer. Capitalization \$3,000,000, shares \$1 par. Lands, 320 acres. Old management, which sold considerable stock, at fancy prices, was ousted, September, 1903. Apparently moribund.

ARIZONA GOLD & COPPER CO.

ARIZONA.

Office: 30 Broad St., New York. Mine office: Patagonia, Santa Cruz Co., Ariz. Floyd B. Wilson, president; Frederick K. Jones, secretary; Col. Geo. W. Crowe, general manager; Harry L. Vaughn, superintendent. Organ-

ized February, 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Debentures, \$32,500 first-mortgage 6% bonds, dated Feb. 1, 1902. Lands, 7 claims, area 140 acres, in the Tyndall district of the Santa Rita mountains, including the Gaelic, Trenton and Salero mines, opened by 7 shafts and a tunnel, latter showing a 4' vein said to average 3% copper, 15% to 20% lead and 10 oz. silver per ton. Has a 50-ton concentrator, built 1903, and an 80-ton smelter, at Patagonia. Idle.

ARIZONA GOLD & COPPER MINES CO.

ARIZONA.

Letter returned unclaimed from former office, 19 Park Row, New York. Mine office: Wickenburg, Maricopa Co., Ariz. Property was the Angel mine, showing gold and copper ores.

ARIZONA GOLD & COPPER REDUCTION CO.

ARIZONA.

A swindle, promoted by the notorious Theodore Stegner.

ARIZONA GOLD MINING CO.

ARIZONA.

Letter returned unclaimed from former office, Chamber of Commerce Bldg., Portland, Ore. Mine office: Wickenburg, Maricopa Co., Ariz. O. H. Perry, president and general manager; W. T. Perry, secretary. Ores carry gold and copper.

ARIZONA GOLD MINING & MILLING CO.

ARIZONA.

Dead. Formerly operated the Swallow mine, at Briggs, Yavapai county, Arizona.

ARIZONA-HANCOCK CONSOLIDATED MINING CO.

ARIZONA.

Office: Hancock, Mich. Mine office: Florence, Pinal Co., Ariz. John D. Cuddihy, president; Alfred C. Sieboth, vice-president and superintendent; Henry L. Baer, secretary and treasurer. Organized Mar. 26, 1903, under laws of Arizona, as successor to the Arizona & Hancock Mining Co., with capitalization \$500,000, shares \$10 par. Annual meeting, first Tuesday after first Monday in March. Lands, 4 claims, company having thrown up the 15 claims formerly held in the Globe district. The Pinal county lands show a vein traversing two claims parallel to the vein of the Lake Superior & Arizona, with diabase footwall and limestone hanging, opened by a short tunnel and a winze of 55', with drifts on two levels, showing lead above and copper below. Idle.

ARIZONA & HANCOCK MINING CO.

ARIZONA.

Succeeded, March 26, 1903, by Arizona-Hancock Consolidated Mining Co.

ARIZONA-MEXICAN COPPER CO.

MEXICO.

Office: Phoenix, Arizona. Mine office: Caborca, Sonora, Mexico. J. E. Hubinger, president; W. E. Defty, vice-president and consulting engineer; W. C. Foster, treasurer; C. T. Vincent, superintendent; J. C. Flores, mine foreman. Organized February 14, 1902, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par; issued, \$2,220,000. Lands, 79 pertenencias, known as La Gran Proveedora de Cobre, in the Altar district, 75 miles from the Sonora Railway. Country rock is granite, ores carrying an iron and spar gangue, forming an ideal self-fluxing ore. Vein is 228' wide, giving average assays of 6.7% copper, 12 oz. silver and \$2 gold per ton, and is opened by shafts of 102' and 200', and by tunnels of 209' and 228'. A winze

from a 190' drift follows the footwall, entirely in ore, with druses of very rich carbonates. About 2,500' of underground openings have been secured, of which 2,300' are in ore. Extreme depth reached is 525'. From the 400' level down, some ore bodies assayed 22% to 30% copper and as high as 131 oz. silver per ton. Company is said to have ordered a 100-ton smelter, late in 1905. Management is good and property gives promise of making a large and successful mine.

ARIZONA-MEXICAN MINING &**ARIZONA & CALIFORNIA.****SMEETING CO.**

Works office: Needles, San Bernardino Co., Cal. H. K. Hartzel, president; H. H. Godshall, secretary and treasurer; Dr. L. D. Godshall, general manager and resident director. Property, formerly held by the W. S. Fletcher Mining & Smelting Co., includes the Banner group of mining claims, on Stockton Hill, 12 miles north of Kingman, Mohave county, Arizona, showing ores carrying values of about \$30 per ton in gold, silver and lead. The Infallible mine shows a 20' vein of high-grade ore. Company also owns 16 idle claims near Florence, Pinal county, Arizona.

The smelter, at Needles, has been remodeled and slightly enlarged by the present owners, and now has about 125 tons daily capacity. The plant has both lead and copper stacks, with mechanical roaster, and a small but complete sampling mill.

ARIZONA & MICHIGAN DEVELOPMENT CO.**ARIZONA.**

Mine office: Benson, Cochise Co., Arizona. Employs 25 men. A. J. Pidgeon, president and general manager, L. J. Buchanan, treasurer; S. Roemer, secretary and assistant treasurer; Robert P. Franck, superintendent. Lands include the Copper Chief group, area 43 acres, adjoining the Arizona Consolidated Mining Co. Has vertical and incline shafts, showing a 5' vein, with poorly defined walls, and impregnations in the limestone hanging-wall and porphyry footwall. Ores are cuprite, melaconite and copper sulphides, giving average assays of better than 9%. Has an 85-h. p. hoist, and has shipped several carloads of good ore to El Paso.

ARIZONA MINE.**WYOMING.**

Office and mine: care of Horace E. Adams, owner, Hecla, Laramie Co., Wyoming. Works 5 men in summer; idle winters. Lands, 4 claims, area 80 acres, in the Silver Crown district, opened by a 160' shaft and tunnels of 100', 100', and 120', showing native copper, oxides, carbonates, chalcocite and chalcopyrite. Has gasoline power and a small leaching plant.

ARIZONA MINES CO.**ARIZONA.**

Mine office: Casa Grande, Pinal Co., Arizona. C. L. Shaw, superintendent.

ARIZONA MINING CO.**NEW MEXICO.**

Office: 311 Pozzoni Bldg., St. Louis, Mo. Letter returned unclaimed from former mine office, Pinos Altos, Grant Co., N. M. Ores carry gold, silver and copper.

ARIZONA NATIONAL COPPER CO.**ARIZONA.**

Office: 327 Pine St., Williamsport, Pa. Mine office: Globe, Gila Co., Arizona. Employs 4 men. Thos. M. B. Hicks, president and treasurer;

C. S. Messerly, secretary; Le Roy Scholl, general superintendent. Organized February 1, 1906, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. Bonds, \$300,000, at 5%. Lands, 14 claims, area circa 450 acres, also a 15-acre millsite and 100 acres timber lands, on Pinto Creek, showing a contact vein between schist and granite, averaging 14' in width, and traced 785', giving average assays of 9% copper and \$4 gold per ton, from chrysocolla, chalcopryite and occasional bornite. Development is by shafts of 50' and 85' and tunnels of 195', 250', and 300', with a total of 2,000' of openings. Management estimates 18,840,000 tons of concentrating ore and 3,297,000 tons of smelting ore in sight, with 1,000,000 tons blocked out for stoping, which figures are sadly in need of revision by a truly modest man.

ARIZONA-PACIFIC COPPER CO.

ARIZONA.

Office: 705 State Life Bldg., Indianapolis, Ind. Mine office: Florence, Pinal Co., Ariz. F. P. Jeffries, president; John W. Sharpe, vice-president and general manager; Henry Severin, treasurer; Murat W. Hopkins, secretary; E. R. Stafford, superintendent. Organized March 30, 1903, under laws of Arizona, with capitalization \$5,000,000 shares \$1 par. Lands, 16 claims, area 330 acres, also an 80-acre smelter site and 160 acres of possible oil lands, lying at Wooley, about 7 miles south of Kelvin, connected by 4-mile wagon-road with the Phoenix & Eastern railway, which has a switch for the company. Property shows sundry minor veins, assaying 3% to 20% copper and \$5 to \$20 gold per ton. A quartz-porphry dyke, 1,200' long and about 500' in extreme width, with axes east and west, is shattered in every direction, and cemented by veins carrying cuprite, melaconite and chalcocite, giving estimated average values of 3% copper, 1 oz. silver and \$2 gold per ton. Has shafts of 80' and 350', 600' apart, also tunnels of 260' and 342', at same distance. Has 2 gasoline hoists, air-compressor, power drills, and necessary mine buildings. Officers of company are men of good standing and the property is regarded as promising, owing to great size of the ore body, though the ore is low in tenor, but well adapted to close and economical concentration. Development is continuing on a modest scale.

ARIZONA SMELTING CO.

ARIZONA.

Office: 71 Broadway, New York. Mine office: Middelton, Yavapai Co., Ariz. Works office: Humboldt, Yavapai Co., Ariz. Employs about 80 men. John L. Elliott, president; Chas. E. Finney, vice-president and general manager; Benj. Prince, secretary and treasurer; preceding officers, Frank M. Murphy and Arthur Braun, directors; R. T. Mason, mine superintendent; E. H. Hamilton, smelter superintendent; Cyrus Robinson, consulting engineer; Pope Yeatman, mining engineer; L. Douglass Anderson, mechanical engineer; E. W. Brooks, purchasing agent and chemist; Jas. D. Grant, auditor and cashier. Organized February, 1905, under laws of New Jersey, with capitalization \$150,000, shares \$100 par. Bonds, \$180,000 issued, at 5%. Annual meeting, first Monday in December.

All buildings of the concentrating and smelting plant are of steel frame, with steel roofs, brick walls and cement floors. The concentrator, of 400

tons daily capacity, is 160x200', equipped with 2 Blake crushers, 2 centrifugal crushers, 4 trains of rolls, 2 Hancock jigs, 16 Overstrom tables, 16 vanners and 8 sizers.

The smelter is of 1,100 tons daily capacity, and is so constructed that its capacity can be increased easily to 1,500 tons, whenever desired. Smelter has both lead and copper stacks, and is equipped with three 100' Edwards mechanical roasters, a 200-ton blast furnace and two 100' reverberatory furnaces of the Anaconda type, rated at 450 tons daily capacity each. The converter has two stands. Connected with the smelter is a small but complete sampling mill, operated automatically throughout. The power plant has four 375-h. p. Stirling water-tube boilers, burning waste gases. The entire plant is operated by electricity, having two 450-h. p. cross-compound condensing generators. California crude oil is used for fuel in the reverberatory furnaces. The plant includes electrically driven turbine pumps.

Miscellaneous buildings include machine shop and laboratory. The reduction plant has a complete water system and electric light plant, with about 4 miles of standard-gauge railroad, laid with 65-lb. rails.

Smelter was blown in early in 1906, and is planned to do a custom business exclusively. The company is receiving and paying cash for custom ores. Cost of the plant presumably is greater than total capitalization and bond issue of the company, which is something of a novelty. The plant is thoroughly modern throughout, and the enterprise appears legitimate and businesslike in every detail.

ARIZONA SYNDICATE.

ARIZONA.

Letters returned unclaimed from former office, O. T. Johnson Bldg., Los Angeles, Cal., and from former mine and smelter office, Kelvin, Pinal Co., Ariz. P. B. McCabe, president; O. B. Bachman, secretary and treasurer. Property included the Bobtail and Apache groups of mines, near Kelvin, and a small smelter at Kelvin.

ARIZONA UNION CONSOLIDATED GOLD & COPPER MINES CO.

ARIZONA.

Office: care of Hall & Co., Cincinnati Bldg., Cincinnati, Ohio. J. B. Hall, president; Jos. H. Mageer, secretary. Lands, supposed to be 54 claims, circa 150 miles from Fairfield, Utah, the nearest railroad station. Company's literature deals liberally in glittering generalities. Property idle at last accounts.

ARIZONA UNITED COPPER CO.

ARIZONA.

Office: 35 Wall St., New York. Edmund D. Willetts, president, at last accounts. Moribund.

ARIZONA UNITED COPPER MINING CO.

ARIZONA.

Letter returned unclaimed from former office, St. Louis, Mo.

ARIZONA & WEST LAKE COPPER CO.

ARIZONA.

Letter returned unclaimed from former office, Bisbee, Arizona. John M. Stanaway, president. Organized 1903, under laws of Arizona, with capitalization \$1,000,000. Lands, 18 claims, 3 miles northwest of Packard, Cochise county, Arizona, opened by a 65' shaft.

ARIZPE DEVELOPMENT CO.**MEXICO.**

Office: care of Frank Graf, Bisbee, Ariz. Mine office: La Cananea, Sonora, Mex. J. P. Hallihan, president; G. D. Cash, secretary. Lands, 15 miles southeast of La Cananea, include the Alacran mine, carrying values mainly in silver. Late in 1905 shipped some high grade ore to El Paso, this running up to 175 oz. silver and \$2 gold per ton.

ARIZPE GOLD & COPPER CO.**MEXICO.**

Dead. Had lands in the Arizpe district of Sonora, Mexico.

ARIZPE MINING & DEVELOPMENT CO.**MEXICO.**

Office: Chicago, Ills.

ARLINGTON-BURNS COPPER-GOLD CO., LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from former offices in Chicago and Seattle. Mine office: Greenwood, Yale district, B. C. M. M. Lytle, president; Chas. A. Spirk, secretary and treasurer; E. H. Harrison, auditor. Lands, 3 claims, area 86 acres, known as the Arlington, Burns and Blue Bell, 1½ miles from Greenwood, having 627' of development, including opencuts and shafts, with a little stoping. Company apparently moribund

ARLINGTON COPPER CO.**NEW JERSEY.**

Dead. Lands, at Arlington, N. J., sold Sept. 30, 1903, for debt.

ARLINGTON MINE.**WASHINGTON.**

Letter returned unclaimed from former mine office, Conconully, Okanogan Co., Wash. Ores carry gold, silver and copper.

ARMINIUS CHEMICAL CO.**VIRGINIA.**

Office: 56 Wall St., New York. Mine office: Mineral City, Louisa Co., Va. Rowland F. Hill, president; W. Maw, secretary; Alvin P. Maw, general manager. Mines cupriferous pyrites. Has steam power and a concentrator.

ARMSTRONG MINE.**CALIFORNIA.**

Office: care of W. Roy, Merced, Cal. A prospect, in Indian Gulch, Mariposa county, California.

ARNOLD MINE.**MONTANA.**

Office: care of Dr. G. E. Blackburn, 36 New Owsley Bldg., Butte, Montana. The Arnold and Snow Bird claims are prospects, near Elliston, Powell county, Montana, opened to a depth of 70', to which depth the Arnold has produced \$75,000 worth of copper ore, ranging 10% to 34% in tenor.

ARNOLD MINING CO.**MICHIGAN.**

Office: 64-50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. C. Howard Weston, president; John Brooks, secretary and treasurer; Wesley Clark, superintendent. Annual meeting, second Tuesday in May. Organized 1861, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,550,000. Lands, 3,323 acres, in T. 58 N., R. 31 W., in two tracts, including the Old Copper Falls mine and the Arnold mine proper, with frontage of about 3 miles on Lake Superior. The Copper Falls mine, worked, circa 1850 until August 1893, made 12,843 tons, 429 lbs. fine copper, mainly from the Owl Creek fissure, and paid dividends of \$100,000. The Arnold mine proper, developed on the Arnold ash-bed, was opened 1863, reopened 1897, closed 1901, rock stamped averaging

under 0.8% copper. Has a stamp-mill and $2\frac{1}{2}$ mile narrow-gauge railroad, known as Arnold & Eagle Harbor, rolling stock of which has been sold. No. 1 shaft of the Arnold is about 1,000' deep, sunk at an angle of 26° with the horizon.

ARPS CLAIMS.**CALIFORNIA.**

A group of 15 claims, in Town 34 North, Range 3 West, Shasta county, California, opened by 4 tunnels, of 1,600' aggregate length, giving a fair showing of sulphide ore. Letters addressed to putative owners returned unclaimed from Redding, California.

ARRINO PROPRIETARY COPPER MINING CO.**WEST AUSTRALIA.**

Office. 17, Queen St., Melbourne, Australia. David Blair, manager. Property, in Western Australia, shows sandstone beds of Permian age, ore occurring as bunches and thin veins following the joints and fissures of the sandstone. Ores are mainly oxides and carbonates, with a little sulphide ore exposed recently. Sandstone formation, occupying a basin with gneiss wall, is about 300' wide by one mile long. Bulk parcels of ores shipped have given returns of 3.75% to 25% copper. Property has rail connections, but the process best adapted to treating ores of such unusual nature and occurrence had not been decided upon, at last accounts.

ARTOLA HERMANOS.**CHILE.**

Mine office: Cobijsa, Tocopilla, Antofagasta, Chile. Operate the Gatico mine, opened 1891. Product, shipped as matte, is equivalent to an average annual output of 1,000 to 1,200 metric tons of fine copper.

ERZBERGWERKE ASBECK BRÜGGEN-**GERMANY.****UND BRÜGER-ROBERT.**

Mine office: Rönshahl, Westfalen, Germany. Idle.

ASCOT MINE.**QUEBEC.**

Mine office: Capelton, Sherbrooke Co., Quebec. Presumably idle.

ASHBED MINING CO.**MICHIGAN.**

Office: 64-50 State St. Boston, Mass. Mine office: Copper Falls, Keeweenaw Co., Mich. C. Howard Weston, president; John Brooks, secretary and treasurer; Wesley Clark, superintendent; preceding officers, T. P. Farmer and W. C. Fiske, directors. Organized, 1880, under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. Annual meeting, second Tuesday in March. Lands, 1,143 acres, in vicinity of Copper Falls, adjoining the Arnold mine. Property was known originally as the Petherick. Work was resumed on a small scale June, 1905, and in March, 1906, was in progress on two levels, point of attack being a cross-fissure vein. Fully described in Vol. II.

ASHEBORO COPPER MINING CO.**NORTH CAROLINA.**

Mine office: Asheboro, Randolph Co., N. C. H. D. Landers, president; D. M. Holliday, vice president; W. C. Hammond, treasurer; M. W. Parrish, secretary; W. L. Thurber, manager. Organized under laws of North Dakota, with capitalization \$100,000, shares \$1 par. Lands 93 acres, on which a little mining was done in the Nineteenth Century. Has shipped a carload of ore giving returns of \$16.85 per ton, with copper returns of 8.6% and small

gold values. Also has an option on 400 acres of gold-bearing lands.
ASHIO MINES. **JAPAN.**

Owned by the Furukawa Mining Co.

ASHLAND MINING CO.

COLORADO.

Mine office: Ohio, Gunnison Co., Colo. Carroll M. Carter, superintendent, at last accounts. Property is the Carter group, carrying gold, silver, lead, copper and zinc ores. Has steam power

COMPañIA MINERA DE ASIENTOS.

MEXICO.

Mine office: Asientos, Aguascalientes, Mex. Harry Rab, superintendent. Lands include the Nopensada mine, producing copper and silver. Main shaft, 200'. Has steam and electric power.

WALTER ASKEW.

MEXICO.

Office and mine: Guachinago, Jalisco, Mexico. Property is known as the Ocote, showing a large vein giving good assay values in copper, silver and gold.

SOCIETE CIVILE DES MINES DE CUIVRE D'ASPEICH.

FRANCE.

Offices: 3, Rue de Milan, Paris, France. G. Caton, manager, at last accounts. Lands are in the Basses Pyrenees, France. Idle.

ASTOR MINING CO.

COLORADO.

Mine office: Eureka, San Juan Co., Colo. E. C. Condit, superintendent. Property includes the Surprise, Mogul and other claims, carrying ores of gold, silver, lead and copper. Has steam, water and electric power.

SOCIEDAD INDUSTRIAL ASTURIANA.

SPAIN.

Office: Oviedo, Spain. Mine office: Torres, Teruel, Spain. Lands are a group of slightly developed claims, near Torres.

SOCIEDAD INDUSTRIAL DE ATACAMA.

CHILE.

Office and works: Tierra Amarilla, Copiapó, Atacama, Chile. Mines include the Lautaro, at Almolanos, in the San Antonio district of Copiapó, and other properties, and the company also has an idle smelter at Caldera. In 1903 the smelter at Tierra Amarilla treated 17,526 metric tons of ore, giving average returns of 11% copper, with considerable gold values, product being shipped to Wales as a rich auriferous copper matte.

ATACAMA MINERAL CO., LTD.

CHILE.

Voluntarily liquidated, July, 1902.

ATE MINE.

JAPAN.

Mine office Komatsu, Kaga, Japan. Works two main veins, in liparite and brecciated tufa, one being a fissure and one a contact vein. These veins cross, intersection giving the richest ore, and at a little distance from the point of intersection the veins thin out and become ofpo or quality. Ore is chalcopryrite, with iron pyrites, showing bornite and tenorite, averaging about 10% copper in the upper portions. Production, 1900, was 231,484 lbs. fine copper.

ATHELSTAN GOLD MINING CO., LTD.

BRITISH COLUMBIA.

Absorbed, 1904, by Montreal & Boston Cons. M. & S. Co.

ATHELSTON & JACKPOT MINING CO.

BRITISH COLUMBIA.

Absorbed, 1904, by Montreal & Boston Cons. M. & S. Co.

ATLANTIC MINING COMPANY.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Atlantic Mine, Houghton Co., Mich. Employs about 700 men, when working. Organized December, 1872, under laws of Michigan; reincorporated, 1901, for term of 30 years, and capitalization increased, 1902, to \$2,500,000, shares \$25 par; \$9.80 paid in. Annual meeting, second Tuesday in March. American Loan & Trust Co., Boston, transfer agent, Boston Safe Deposit & Trust Co., registrar. Jos. E. Gay, president; John R. Stanton, secretary and treasurer; preceding officers, Wm. C. Stuart, J. Wheeler Hardley, Wm. A. Paine and Samuel L. Smith, directors; Frank McM. Stanton, agent; Theodore Dengler, superintendent; F. G. Coggin, mill superintendent; John Stratton, mining captain; A. D. Edwards, clerk; John Grigg, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$280,000.00
Amount paid in by conveyance of property	700,000.00
Entire amount invested in real estate.....	20,349.66
Amount of personal estate.....	457,927.38
Floating debt.....	107,570.17

Comparative figures for four years are as follows:

	1901	1902	1903	1905
Mineral produced, lbs.....	6,317,645	6,847,270	7,670,660	5,475,704
Refined copper, lbs.....	4,666,889	4,949,366	5,505,598	4,049,731
Total income.....	\$ 735,577	\$ 588,200	\$ 722,386	\$ 642,305
Expenses at mine.....	573,341	535,956	517,384	512,025
Smelting and transp'n....	62,954	62,954	64,567	50,321
Interest.....	.....	.....	4,199	.....
Total cost.....	636,296	598,910	586,151	562,347
Mining profits.....	99,281	.....	136,234	64,862
Land sales.....	11,600	47,788	25,000	.....
Construction.....	191,143	38,676	10,893	15,095
Balance.....	-80,262	-1,598	+150,341	+64,862
Dividends.....	.....	.....	.....	50,000
Surplus.....	95,699	94,101	244,443	365,220

A dividend of 50 cents per share, amounting to \$50,000, was paid February 15, 1905. Last previous dividend was \$1 per share, amounting to \$40,000, in 1901.

The Atlantic mine proper lies about 2 miles south of Portage Lake and 4 miles southwest of Houghton, the 640-acre main tract including the mines known before 1872 as the South Pewabic and Adams. The Pacific lies on the north, Isle Royale and undeveloped lands on the east and south, and the Pacific and St. Mary's Mineral Land Co. on the west. The Atlantic lands are all on the mineral belt, being the south half of Section 4, except the South-east quarter of the southeast quarter, the north half of Section 9, and the northwest quarter of the northwest quarter of section 10, all in Town 54 North, Range 34 West. The company also owns all of Section 16, same town

and range, bought 1897, also several thousand acres of timber lands, a millsite on Lake Superior, and valuable frontage on Portage Lake.

The mine is opened on an amygdaloid bed of brownish, mottled color, averaging about 15' width, with strike of N. 50° E., and dip of 54° to 55° to the northwest. The lode is the most westerly worked in Houghton county, and is known locally as an ashbed, being in line with the probable southwesterly continuation of the Keweenaw county ashbed, which it resembles. The Atlantic ashbed carries the least copper of any lode now worked successfully, and long has been famous for its profits, wrung from rock yielding much less than 1% ingot copper. The low percentage of copper carried by the lode is a decidedly adverse factor, but the mine, under its present management, has met and survived many discouragements, including lean rock, mine fires, costly equipment necessitated by deepening shafts, installation of new machinery, the construction of a new mill, and the building of a private railroad required for the traffic of the mine. Among other disadvantages are a wet mine, causing heavy pumping charges, and a treacherous hanging-wall, necessitating the heaviest timbering used in any amygdaloid mine of the Lake Superior district, timbering charges having been unusually heavy since 1901. To offset all this there are certain marked advantages, the ashbed being the softest rock mined in the district, requiring less power in drilling, less dynamite in breaking, and less steam in stamping, than any other lode, and breaking well, while everything is mined from wall to wall. Until 1905 no rock assortment was attempted, but for the past year rock estimated to carry less than 14 lbs. fine copper per ton has been discarded. Apparently the deepest openings of the mine are as rich as the sections nearer surface.

There are 6 shafts, lettered in order from north to south. "A" shaft, the northermost, opened 1897, to develop new ground, sunk at an angle of 54°, is the largest in dimensions of any shaft, being 9x20' inside of timbers, with three compartments. Surface improvements, completed 1899, include a wooden shaft-rockhouse, 35x67 on the ground and 84' high, with four rock-crushers, a 38x50' boiler-house with red-tone walls and steel truss roof, and a 48x50' engine-house, of the same construction, containing a 26x48" Corliss engine of Allis-Chalmers make, with double conical drum of 10' diameter at either end, and 15' 6" in the center, raising 9-ton skips. This shaft proved lean, especially in the north drifts, toward the Pacific tract, and careful mill tests proving this the poorest part of the mine, "A" shaft was abandoned in 1904.

"B" shaft, 1,377' southeast of "A," with two compartments, is circa 2,200' in depth, showing good copper ground. Surface equipment is very complete, including a double conical drum Corliss hoist of Allis-Chalmers make, similar in design to the plant at "A" shaft, but much larger throughout, the drum being 12' at each end and 24' 4" in diameter at the middle, where there is a cylindrical section 18" wide, thence tapering sharply in both directions. The drum has a 22' face and weighs 140 tons, all grooves being lathe-turned for 1¼" steel cable. The hoist is operated in counterbalance

and is good for a depth of 4,000', 11-ton skips being raised at a speed of 3,400' per minute. The hoist operates at a steam pressure of 100 pounds to the inch, and is direct-acting and non-condensing, with band brakes at either end, set by gravity and instantaneously released by steam power.

"C" shaft, next southwest, was abandoned after the fire of 1898.

"D" shaft, 1,465' southwest of "B," 3,000' in depth, the deepest and best shaft of the mine, is 9x18' in size inside of timbers, with three compartments, two for skips worked in balance. The engine-house, 48x60', of red-stone with steel truss roof, houses a Nordberg hoist working in balance, capable of hoisting 6-ton skips from one mile depth. The boiler-house has four 150-h. p. Stirling boilers. This shaft looks well and gives promise of good rock for the future, as it commands a large territory, and the bottom levels are the richest, and furnish the bulk of the Atlantic's production. There were seven active levels at the close of 1905.

"E" shaft, 2,440' deep, is used for a man-way and pipes only.

"F" shaft, 478' southwest of "D", long was a large producer, but was put out of commission in 1902, at 2,146' depth.

In 1904 serious trouble was experienced with caving ground and "air-blasts." An air-blast is merely the compression of air in underground openings caused by the fall of considerable quantities of rock in old workings. The trouble became so acute that the management decided to change the entire plan of mining. The operating shafts are to be sunk to the boundary, thence levels run to the extreme length operated, beginning at the bottom, and stoping backwards toward the shafts, using waste rock for filling, so far as possible and permitting the ground to follow in when stoped out. The plan is not one that will present itself to experienced mining men as ideal, being a somewhat undesirable modification of the caving plan, but the Atlantic is facing a crisis, in which its very existence is threatened, and none of the critics have been able to offer a better plan. Any improvement will be thankfully received by the management, which has been sorely put to it by caving ground and drawing shafts. Swapping horses while crossing a stream, or building a new house on the site of an old one while living in the latter, are kindergarten tricks compared with the problem of changing over the plan of operating the Atlantic. The new plan calls for leaving a 20' floor on each level, and stoping backward to the shafts. To secure rock for mine filling will require considerable underground selection.

In May, 1906, the already tense situation was rendered more acute by the drawing of all operating shafts, which greatly alarmed the miners, and interfered with running the skips. The hanging wall began subsiding from the bottom. This subsidence ended in a few weeks, but was so serious that the mine was closed down. The damage to the old shafts was so great that the mine was yet idle in August, 1906, and it may be found necessary to reopen the mine by entirely new shafts, sunk in the footwall.

Equipment includes a 50-drill Ingersoll-Sergeant air-compressor, machine, carpenter and blacksmith shops, and a sawmill. The principal buildings have fire pumps, and there is an efficient volunteer fire brigade. The village de-

par. Lands, 10 claims, in the Francis district, on the line of the Santa Fé & Grand Canyon railroad, showing promising ore bodies. Presumably idle.
AZURITE COPPER & GOLD CO. **ARIZONA.**

Dead. Lands sold to Mineral Hill Consolidated Copper Co.
AZURITE MINING CO. **WYOMING.**

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. Henry L. Larsen, president; Arthur Bishop, vice-president; H. O. Granberg, secretary, treasurer and general manager; E. N. Sanders, superintendent; Frank Earle, consulting engineer. Organized Dec. 17, 1904, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued, \$635,000. Lands, 5 claims, area 100 acres, in the Battle Lake district. Country rocks are limestone, quartzite and gabbro, showing 3 fissure veins in latter, these averaging 15' to 20' width, and giving assays of 18% copper, from a 65' shaft and a 70' tunnel.

BABCOCK & KITTERMAN GROUP. **OREGON.**

Mine office: Althouse, Josephine County, Oregon. A prospect, on which limited development work has shown ore giving good assay values. Idle.

BABY McKEE GOLD MINING CO. **OREGON.**

Mine office: Sumpter, Baker Co., Ore. L. G. Lilley, manager, at last accounts. Ores carry gold silver, lead and copper. Has steam power.

BACHELOR GOLD MINING CO. **COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. C. F. Meek, superintendent. Ores carry gold, silver, lead and copper. Has water power.

BACKUS & JOHNSON. **PERÚ.**

Office and works: Casapulca, Oroya, Perú. Has a small but well-equipped and thoroughly modern smelter, said to be second in Perú only to the great plant of the Cerro de Pasco. Ores treated are mainly from small independent mines of the Cerro de Pasco district. Works are located 88 miles from Lima, at an altitude of 13,606'. Ores under 12% are not treated. German and English coke is used for fuel, and product is exported, as a 50% matte.

BADEN-BADEN GOLD MINING CO. **COLORADO.**

Office: 324 Cooper Bldg., Denver, Colo. Mine office: Black Hawk, Gilpin Co., Colo. Newell Bros., managers. Mine has auriferous and argentiferous copper ores, with steam power.

BADGER COPPER CO. **WYOMING.**

Letter returned unclaimed from former office, Laramie, Wyoming. Organized, 1902, to operate in Albany county, Wyoming.

BADGER MINE. **COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Is on the Platte river, 12 miles east of Pearl. Owned by Alex. Hilton, et al. Has a limited amount of development work, giving a fair showing of high-grade ores.

BADGER STATE MINING & MILLING CO. **WYOMING.**

Office and mine: Saratoga, Carbon Co., Wyo. Gustav Jensen, president and manager; John H. Davis, vice-president and superintendent; C. E. Jensen, treasurer; A. H. McDougal, secretary. Organized December 26, 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands,

8 claims, area 140 acres, on Jack Creek, showing 3 fissure veins, averaging 4' width, claimed to give average assays of 50% copper, 50% lead and from a trace up to 400 oz. silver per ton, opened by shafts of 60' and 105', and by a 90' tunnel.

BAGDAD GOLD & COPPER CO.

CALIFORNIA.

Office: care of Gordon & Co., 254 Wilcox Bldg., Los Angeles, Cal. Mine office: Bagdad, San Bernardino Co., Cal. Sherman Washburn, president; V. L. Carroll, secretary. Is a prospect only, with about 250 feet of openings. Idle.

BAHIA EXPLORATION CO.

BRAZIL.

Has sundry claims circa 50 miles west of Jaguarary, Brazil, showing ores assaying 2% to 4% copper.

BAKER CONSOLIDATED COPPER MINING CO.

Office: 4 Campau Bldg., Detroit, Mich. John Baker general manager. Organized under laws of District of Columbia, with capitalization \$2,500,000. Location of property, if any, not known. Is regarded with suspicion.

BAKER MILLING, SMELTING & REFINING CO.

Office: 4 Campau Bldg., Detroit, Mich. John Baker, president; John E. Rolland, secretary and treasurer. Organized under laws of Oklahoma, with capitalization \$10,000,000. President claims to be putting a plant in Detroit, to be in operation during 1906. Is regarded with suspicion.

BALACLAVA COPPER MINING CO.

AUSTRALIA.

Mine office: Broken Hill, N. S. W., Australia. W. O. H. Simons, superintendent, at last accounts. Has auriferous copper ores.

BALADE MINE.

NEW CALEDONIA.

Mine office: presumably Noumes, New Caledonia. Discovered 1884. Ores are concentrated up to 17% to 20% copper, when working. Presumably idle.

BALAKLALA CONSOLIDATED COPPER CO.

CALIFORNIA.

Office: 60 State St., Boston, Mass. Mine office: Kennett, Shasta, Co., Cal. Joseph A. Coram, president; Clarence K. McCornick, treasurer, C. O. Ellingsworth, secretary; Duncan McVichie, general manager; Robeson White, smelter superintendent. Capitalization \$1,000,000, shares \$5 par. Control of company was sold twice, and a reorganization was required to untangle matters, present company succeeding the Balaklala Mining Co.

Lands, 64 claims, adjoining the Trinity. Principal development is on El Capitan group, opened by tunnels, showing a sulphide ore body 60' to 100' wide, on the 400' level, ore ranging from very poor to very good, and claimed to show an average of better than 11% copper, but placed more conservatively at about 3.7% copper, with small gold and silver values. Property has been extensively probed by diamond drills, which have shown several large deposits, about 100' below the body opened by tunnel. Ore occurs in lenses, the largest being estimated as 50x500x700' in size. Mine is claimed to have 300,000 tons of ore in sight, which probably should be scaled about one-third.

The company's smelter site, area 320 acres, between Kennett and Shasta is in Section 20, located Nov. 1, 1905, on an Indian allotment thrown open 20 days later, so title does not seem quite clear. Smelter is planned for 3

units of 2,100 tons aggregate capacity. First unit, of 700 tons, is expected to go into blast in 1907.

BALAKLALA MINING CO.

CALIFORNIA.

Succeeded, circa 1904, by Balaklala Consolidated Copper Co.

BALD MOUNTAIN MINING CO.

WASHINGTON.

Mine office: Clear Lake, Skagit Co., Wash. A. H. Rogers, superintendent, at last accounts. Idle.

BALHANNAH COPPER & GOLD MINE, LTD.

AUSTRALIA.

Dead, though apparently not buried.

BALHANNAH MINE.

AUSTRALIA.

An old mine, at Onkaparinga, South Australia, 14 miles southeast of Adelaide. Ores carry copper, lead, zinc, silver, gold and bismuth. Idle for many years.

BALKAN COPPER CORPORATION, LTD.

TURKEY.

Offices: Chiswell House, Finsbury Pavement, London, E. C., Eng. Sir Owen R. Slacke, chairman; Ernest A. Foster, secretary; Mario Krieger, managing director in Turkey. Organized Sept. 5, 1899, with capitalization £250,000, shares £1 par; issued, £220,000. Property is the Yardimli copper mine, area 7,900 acres, and the Chapzi-Hane mine, area 2,500 acres, in the Rhodope Mountains, northwest of Constantinople, held on an annual rental of £420, plus 5% royalty on gross earnings. Idle for several years.

BALLA BALLA COPPER MINES, LTD.

AUSTRALIA.

Reorganized, April 16, 1901, as New Balla Balla Copper Mines, Ltd.

BALLARAT COPPER MINING CO.

WASHINGTON.

Mine office: Newport, Stevens Co., Wash. Ores carrying copper, gold and silver, have been opened by a crosscut tunnel. Idle at last accounts.

BALLARAT & LYELL MINES, LTD.

TASMANIA.

Offices: Broad Street House, London, E. C., Eng. Herbert Allen, chairman; M. V. Ward, secretary. Organized, Jan. 23, 1903, as a reconstruction of the Great Mt. Lyell Copper Co., Ltd., with capitalization £250,000, shares £1 par; issued, £51,000. Debentures, £1,000. Apparently now holds no copper property in Tasmania.

BALSAS MINES.

MEXICO.

Sundry properties, said to be located not far from Inguarán, in the state of Michoacán, Mexico. Alleged to be operated by German capitalists, but no trace of active operations found.

BALTIC MINING CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Baltic, Houghton Co., Mich. Employs about 800 men. Wm. A. Paine, president; Frederick Stanwood, secretary and treasurer; preceding officers, Joseph E. Gay, Samuel L. Smith and Cameron Currie, directors; F. W. Denton, superintendent; C. G. Mason, engineer; Martin Trethewey, mining captain; Wm. C. Cole, clerk; F. G. Coggin, mill superintendent; W. J. Richards, master mechanic. Organized December, 1897, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$18 paid in. Began dividends 1905, with disbursements of \$1,250,000. Annual meeting, first Monday in March.

Practically the entire stock issue of the Baltic is owned by the Copper Range Consolidated Company.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures.

Amount of cash paid in on capital stock	\$1,800,000.00
Amount paid in by conveyance of property	1,000,000.00
Entire amount invested in real estate	1,014,751.00
Amount of personal estate	820,120.31
Amount of floating debt.	144,452.65

Lands, 800 acres, near the Eastern Sandstone of the Keweenaw copper belt, about 75 acres being on the sandstone and non-mineralized. Holdings comprise all of Section 21 except the southeast quarter, also the west half of Section 20, Town 54 North, Range 34 West. Lands are bounded on the north by the Wheal Kate and Section Sixteen of the Atlantic; on the east by St. Mary's Mineral Land Co.; on the south by St. Mary's lands, lands of Hussey, Howe & Co. and the Trimountain mine; on the west by the Trimountain. In 1905 exchanged parcels of 39 acres with the Atlantic mine, which will enable the Baltic to sink No. 5 shaft to much greater depth than otherwise possible. The Baltic is $2\frac{1}{2}$ miles due south of the Atlantic, and its northernmost shaft is not quite 4 miles south of No. 10, the southernmost shaft of the Huron mine of the Isle Royale. To the southward the Trimountain and Champion mines are opened on the same lode, which has a strike of N. 63° E., from Baltic shafts 2 to 5, and to the northward the Superior mine is being developed on the same bed. The dip of the lode averages about 73°, being the sharpest of any developed cupriferous bed in the Lake district.

The Baltic shafts are numbered from south to north, and there is a distance of 3,025' between the extreme shafts, with room for one additional shaft at each end, though a possible No. 6 would be cut off at comparatively shallow depth by the Section 16 tract of the Atlantic, hence it is probable No. 5 will remain the northernmost shaft.

No 1, the discovery shaft, located between Nos. 2 and 3, was sunk at a wrong angle, and was abandoned at a depth of 219'.

No. 2 shaft, the southernmost, was 725' deep at the close of 1905, and was showing very promising ground. Production from No. 2 is planned to begin in the spring of 1906. The equipment, added 1905, includes engine-house, boiler-house, compressor building, steel rock-shafthouse and a new hoist. The boiler-house has two 250-h. p. Stirling water-tube boilers, and the compressor has capacity to reduce 4,000' of free air per minute to a pressure of 70 lbs. per square inch.

No 3 shaft, 1,170' northeast of No. 2, and 1,200' deep at end of 1905, has a steel, sheathed frame shaft-rockhouse, 36x71', with 17x31' wing, 88' high, with 1,400-ton rock-bins, fitted with a 16x18" engine, and two 18x24" Blake crushers.

No. 4 shaft, 900' northeast of No. 3, was 1,150' deep at close of 1905, with duplicate shaft-rockhouse of No. 3, and a 5,000' Nordberg conical hoist.

No. 5 shaft, the northernmost, is 855' northeast of No. 4, and was 910'

deep at close of 1905. Shaft-rockhouse is a duplicate of those at Nos. 3 and 4. Hoist is a duplex Nordberg, good for 1,500'. The ground was considerably disturbed in the upper levels of No. 5, but is growing more settled at the bottom, the showing of the tributary openings ranging from poor to good, with improvement at depth.

The Baltic amygdaloid, taking its name from the first mine opened upon it, was first found in 1882, but was abandoned at 90' depth, because a drill hole, pitched at a wrong angle, ran into the hanging-wall. The Baltic is an exceptionally strong lode, ranging from 15' to 60' in width, so well mineralized that at most points it must be more or less thoroughly beaten away from wall to wall. The great width of the stopes has brought about the use of a walling system, by which waste rock is built into dry-walls along the drifts, thus saving timbering, while giving stronger walls than any timber could supply, and saving the cost of hoisting lean rock. The walling system of the Baltic has proven a success under actual test. A little melanconite is found in narrow fissure veins crossing the lode, these being too small to follow, but the black oxide ore mined in the stopes is saved in the milling, carrying 35% to 40% copper as dressed, and smelts readily with the native copper mineral. The native copper of the Baltic is arsenical, and it is probable that a small amount of copper arsenides are mined and milled, as narrow arsenical fissure veins occur occasionally in the district south of Portage Lake. While the finished copper is arsenical, it makes wire of great tensile strength.

The compressor-house, between shafts 3 and 4, is 36x58' in size, with concrete foundations, stone walls and steel roof, housing a compressor with capacity to reduce 4,000 cubic feet of free air per minute to a pressure of 70 lbs. per inch. Adjoining is a boiler-house of similar material, 49x76', with wing 12x62', having four 250-h. p. Stirling water-tube boilers and a 140' self-supporting steel smokestack. This boiler plant supplies steam for shafts 3 and 4. Adjoining the boiler-house is a 360' coal trestle, with storage capacity of 5,000 tons, underneath being a 5x8' concrete tunnel, through which coal is hauled in tram-cars, on a down grade, by an endless cable. An extensive coal trestle was built at No. 2 shaft in 1905. There is a 50x132' combination machine-shop and smithy, with stone walls and steel roof, a 42x72' carpenter shop, a 30x90' miners' changing house, supplied with hot and cold water, bath-tubs and lockers, a good office building and about 100 well-built dwellings for employees. The mine has a complete electric light plant. A considerable town has grown up about the mine, on lands owned by the company. The mine and town are served by the Painesdale branch of the Copper Range railroad, and also are reached by a branch of the Atlantic railway.

The stampmill, at Redridge, on Lake Superior, one half mile west of the Atlantic mill, went into commission December, 1901. The mill proper is 175x195', of structural steel, on stone foundations, with 4 Nordberg stamps having 20x24" cylinders, capable of crushing about 500 tons each, daily. Foundations for the stamps are very massive, the use of timber having been dispensed with, and 90-ton anvil plates set beneath the mortars. Eight Wilfley concentrators have displaced finisher jigs and slime-tables. A com-

pound condensing Corliss engine runs the 4 stamps and washing machinery. The discharge at the mill is 25' above mean water datum, and, with the usual drop of one in ten, provides for the wasting of many millions of tons of tailings by gravity alone. The mill is heated by the Coogan & Strothenke system, air being delivered from 4 blowers, after previous heating by passing over steam-coils, radiation in the coils being insured by the vacuum system. Adjoining the mill is a 55x90' boiler-house, of steel frame on stone foundations, housing five 250-h. p. Stirling water-tube boilers, and a Green fuel economizer. Draft is secured by a set of duplex fans, driven by the mill engine. Behind the boiler-house is a 25,000-ton coal-storage yard, for the joint use of the Baltic and Atlantic mills, coal being brought to the boilers through tunnels, by gravity. The mill has centrifugal crushing rolls and a Huntington mill for regrinding.

Water for both the Baltic and Atlantic mills is furnished by a \$150,000 gravity dam across the mouth of Salmon Trout river, built jointly by the Atlantic and Baltic mines. This structure is built of steel and anchored by its own weight, irrespective of the holding power of the rock. The plan was suggested by J. F. Jackson, of the Wisconsin Bridge & Iron Co., and the details were inspected and approved by Foster Crowell, who acted as consulting engineer during construction of the dam by the Wisconsin Bridge & Iron Co., and Prendergast & Clarkson, the completed work requiring about 1,000,000 pounds of steel and 8,000 cubic yards of concrete work. The dam impounds about 1,250,000,000 gallons of water, and at the river's lowest stage can furnish water to wash 5,000 tons of rock daily, 300 days each year, effecting a saving over pumping of about 2 cents-per ton of rock stamped. The dam is anchored in a cement foundation of great strength, and is in five sections, with a total length of 475', the central or deepest section being 74' high, with wings of 200' on the west and 350' on the east, these being in comparatively shallow water, and made with cement cores built up from excavations in bed-rock, buttressed by earth embankments. The five sections of the dam proper are all of the same general design, the central section being highest, as it is bottomed in the bed of the river, and having a wider and heavier concrete base, with a stronger steel bracing. The dam is of steel throughout, anchored in a concrete base, with braces between the crest of the dam and the extreme foot of the cement base. The following description of the central section will give an idea of the general construction of all five parts: the concrete base is 62' wide, built up from rock excavations. The resultant of all pressures gives a pressure of 2,626,000 pounds for each steel section of 8' width and 74' height. The upper 50' of the dam in this central section of 100' is inclined from the water at an angle of 45°, throwing the point of overturning within the central third of the concrete base, thus allowing an ample margin of safety. The dam is made of plates of best boiler steel, concave on the water side, 8x16' in size and 3-8" thick, riveted and caulked water-tight and supported by parallel inclined "I" beams 24" thick, for the full depth of 50' below the crest of the dam. On the lower section the steel plates are each 8x16' and 3-16" thick, concave, riveted and caulked, but resting directly against the concrete base.

The "I" beams of the upper or main section are supported by heavy triangular frameworks of inclined steel columns and struts. The entire steel structure is anchored to a 2" steel base-plate, at the bottom of the concrete, by a large number of 1.5", 2" and 2.5" steel rods, of 15' to 30' length. Water is taken from the dam about 20' below the crest by three 38" riveted steel pipes, one pipe being on the Atlantic and two on the Baltic side. There is a system of valves and waste weirs, but the structure is of such a nature that it could not be injured were water to flow continuously over its crest for an indefinite period. Surmounting this structure is a trestle of the Copper Range railroad, built at the same time, but in nowise a portion of the dam. The center of the railroad track is 7' above the crest of the dam, 10' down-stream. In the central sections the foundations for the feet of the trestle are all in the concrete work, elsewhere the northern piers for the trestle are separately built.

The Baltic began production with a leased stamp, August, 1899. The Baltic mill was started, with one stamp Dec. 19, 1901. A second stamp was put into commission February, and a third August, 1902, the fourth and last stamp starting on Baltic rock in 1903. The growth of the Baltic is best shown by its figures of production: the mine made 2,641,432 lbs. fine copper in 1901; 6,285,819 lbs. in 1902; 10,580,997 lbs. in 1903; 12,177,729 lbs. in 1904 and 14,384,684 lbs. in 1905. Net earnings were \$397,629.17 in 1903, and \$1,059,165.09 in 1905. At the close of 1905 rock shipments were approximately 50,000 tons per month. No. 2 shaft, when in commission, should add about 25% to the rock production and feed the mill to its utmost capacity. In 1907 the production should be approximately 16,000,000 lbs. fine copper, and the matter of enlarging the mill must be considered soon. To predict the ultimate productive capacity of the Baltic would not be safe. It is at least certain that the mine can double its present output, eventually. The Baltic is a very fine mine, with a highly capable management, and a future that is full of promise.

BALTIMORE COPPER-GOLD MINING CO.

Office: London, Ontario.

BALTIMORE COPPER, SMELTING & ROLLING CO.

MARYLAND.

Office and works: Keyser Bldg., Baltimore, Md. Plant is located on the Baltimore water-front, enjoying one of the best harbors on the Atlantic coast, with direct rail connections, being very advantageously situated for handling both domestic and foreign business. Plant is modern throughout, including large electrolytic works, bullion refinery, sheet-copper rolling-mill and a bluestone plant for making copper sulphate. Material treated is mainly auriferous and argentiferous copper matte from Arizona, Montana and various foreign countries. Management is progressive.

BALTIMORE & SONORA GOLD & COPPER CO.

MEXICO.

Office: 909 Maryland Trust Bldg., Baltimore, Md. J. O. Johnston, president; Chester F. Johnston, secretary. Capitalization \$5,000,000, shares \$10 par. Lands, 387 acres, in the Arizpe district of Sonora, Mexico, on the western slope of the Cananea Mountains, showing large and promising outcrops of carbonate and silicate copper ores. Presumably idle.

BALVANERA MINING CO.**MEXICO.**

Office: 24 Broad St., New York. Herbert T. Beatty, president, and Chas. W. White secretary and treasurer, at last accounts. Lands, 46,000 acres, in the Ocampo and Concheño districts of Chihuahua. Is controlled, through ownership of majority of stock, by the Greene Gold-Silver Co.

BAMBERGER-PIOCHE MINING CO.**NEVADA.**

Office: care of Simon Bamberger, president, Salt Lake City, Utah. Mine office: Pioche, Lincoln Co., Nev. Edward Cutts, superintendent. Lands, 12 claims, lying to the westward of the Nevada-Utah. It is planned to utilize the old Phoenix shaft of the Raymond-Ely mines, for the development of the present company's holdings.

BANNER GOLD & COPPER MINING CO.**WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. Dr. J. L. Jacobs, president; R. W. Eager, secretary. Main tunnel, 101', showing ores assaying up to 18% copper and \$15 to \$33 gold per ton. Presumably idle.

BARAGUNDA MINES.**INDIA.**

Mine office: Baragunda, Hazaribagh, Bengal, India. Were operated, 1887 to 1891, turning out about 1,000 tons of copper in five years. Ore occurs as chalcoppyrite, running only 1% to 3% copper, in a gangue of micaceous schist. All ore treated was carted 24 miles to the smelter, at Giridhi. These are perhaps the most promising copper properties now known in India, despite the low grade of the ore, and might be worked successfully, if given rail facilities, adequate capital and good management.

SUCESION DE BARAZARTE.**CHILE.**

Letter returned unclaimed from former mine office, Paposo, Taltal, Atacama, Chile. Property includes the Reventon mine, 400' deep, and the Abundancia mine, 380' deep, both opened in 1830, also La Unión mine. Has steam power.

BARE HILL MINE.**MARYLAND.**

Office: care of Albert Smyser, owner, York, Pa. An old property, at Mt. Washington, Batimore county, Maryland, showing slightly auriferous and argentiferous chalcoppyrite and bornite. Idle for some years.

BARISTE COPPER CO.**MEXICO.**

Office: 87-84 Adams St., Chicago, Ills. Mine office: Agua Caliente de Baca, Sinaloa, Mexico. Employs 6 men. A. W. Davis, president; J. E. Richardson, vice-president; H. A. Clapp, secretary and general manager; E. R. Austin, treasurer; D. H. Livingston, superintendent; H. B. Clapp, engineer. Organized February 23, 1906, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 24 pertenencias, area 59 acres, in the Alamos district, showing lenses of ore giving assays up to 20% copper and 40 oz. silver per ton, with small gold values, from oxide, carbonate, and sulphide ores. Management plans driving a 1,000' tunnel.

BAROTSE COPPER CO., LTD.**RHODESIA.**

Merged, 1902, in Rhodesia Copper Co., Ltd.

BARRANCA COPPER CO.**MEXICO.**

Office: 170 Broadway, New York. Mine office: Barranca del Cobre,

Chihuahua, Mexico. H. T. R. Cowell, manager. Operates La Purisima mine, producing copper, gold and silver. Main shaft, 750', main tunnel, 2,100'. Has water power, 20-stamp mill, two 4' Huntington mills, a new concentrator, completed 1905, and a 60-ton smelter. Management plans to begin shipping concentrates as soon as the Kansas City, Mexico & Orient Railway reaches Cuesta Prieta, to nearly which point track was laid in March, 1906

BARSTOW MINES.**COLORADO.**

Mine office: Iron-ton, Ouray Co., Colo. John Geisel, superintendent, at last accounts. Ores carry gold, silver and copper.

GEWERKSCHAFT BARTHOLOMÄUS.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Wenden bei Olpe, Westfalen, Germany. Produces argentiferous tetrahedrite and manganiferous spathic iron ore. Has a 65-metre shaft.

BASIN & BAY STATE MINING CO.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Has a large concentrator, leased to La France Copper Co.

BASIN-COMSTOCK CO.**MONTANA.**

Mine office: Cataract, Jefferson Co., Mont. Organized 1904, with capitalization \$500,000, by Wm. A. Kidney, et al. Lands, sundry claims, held under bond and lease, having a 340' shaft showing stringers of ore.

BASIN GOLD & COPPER MINING CO.**MONTANA.**

Office: care of E. R. Holden & Co., 20 Broad St., New York. Mine office: Basin, Jefferson Co., Mont. Robt. B. Smith, president; M. L. Hewitt, vice-president and general manager; B. Lowinson, secretary and treasurer. Lands, 280 acres, patented, known as the Hope mine, on which considerable development has been secured. Company is entangled in litigation, with scant prospects of disentanglement.

BASIN REDUCTION CO.**MONTANA.**

Works office: Basin, Jefferson Co., Mont. Has some sort of close connection with the Basin & Bay State Mining Co. Supplies light and water to the town of Basin. Said, January, 1906, to plan development.

BASLER MINING & DEVELOPMENT CO.**CALIFORNIA.**

Office: 904 J St., Sacramento, Cal. Mine office: Lowry, Tehama Co., Cal. Employs 8 men. Dr. D. L. McLean, president; W. L. Rennie, secretary and treasurer; C. M. Basler, general manager; H. Anchor, engineer. Organized under laws of California, with capitalization \$200,000, shares \$1 par. Lands, 14 claims, partly patented, also a 5-acre millsite and 320 acres miscellaneous lands, opened by a 1,200' tunnel, with 3,000' of underground openings, showing 3 ore bodies, one of 2' to 75' width giving average assays of 2% copper, 2% lead, and \$1 to \$3 gold per ton, from malachite, bornite and chalcopryrite. Company plans continuing development work, which seems to have been done along sensible lines in the past.

BASSETT MINES, LTD.**ENGLAND.**

Office and mines: Bassett Mines, Redruth, Cornwall, England. Henry Trembath, chairman; Richard Rendle, secretary; Wm. James mine manager.

Capitalization £120,000, shares £1 par; issued, £117,500. Lands, 960 acres. at Illogan. Is primarily a tin mine, but produces a little copper. Is developed by shafts and has steam power and a stamp-mill.

BATCHELDER MINE.**WYOMING.**

Office: care of F. E. Brown, Omaha, Neb. Mine office: Dillon, Carbon Co., Wyoming. Is slightly developed by a shaft.

JOHN BATES.**BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Works a conglomerate, carrying native copper. Has steam power.

BATES MINING & SMELTING CO.**MASSACHUSETTS.**

Letter returned unclaimed from former mine office, Charlemont, Franklin Co., Mass. Described in Vols. IV and V.

BATTLE COPPER MINING CO.**WYOMING.**

Office: care of Delaney & Delaney, Colorado Springs, Colo. Mine office: Battle, Carbon Co., Wyo. W. H. Baker, president; J. V. Helm, secretary and treasurer; W. C. Leadbetter, general manager. Organized 1898, under laws of Colorado, with capitalization \$1,500,000, shares \$1 par. Lands, 3 patented claims, area 54 acres, known as the Portland mine, showing 9 contact veins with estimated average width of 30', length 2,000' and estimated average value of 11% copper and \$4 to \$40 gold per ton. Ore is sulphide. Has 13 shafts, of 10' to 218', and a 370' tunnel, latter said to show 35' of 3% copper ore. Has a 6x8" Fairbanks & Morse hoist and a 40-h. p. boiler. Is on the line of the Penn-Wyoming aerial tram.

BATTLE LAKE & BATTLE CREEK MINING CO.**WYOMING.**

Office: care of N. B. Noble, Rice Lake, Wis. Mine office: Battle, Carbon Co., Wyo. Presumably idle.

BATTLE LAKE COPPER EXPLORATION CO.**WYOMING.**

Office: 25 East Pike's Peak Ave., Colorado Springs, Colo. Moribund.

BATTLE LAKE TUNNEL SITE MINING CO.**WYOMING.**

Control sold, 1906, to Penn-Wyoming Copper Co.

BATTLE MOUNTAIN COPPER MINING CO.

Letter returned unclaimed from former office, 60 State St., Boston, Mass.

BATTLESHIP MINING & MILLING CO.**NEW MEXICO.**

Office: 412 Mack Bldg., Denver, Colo. Mine office: Lordsburg, Grant Co., N. M. Dr. O. L. Blachly, president; O. B. Crum, secretary and treasurer. Capitalization \$100,000, shares \$1 par. Lands, 2 groups of 2 claims each, area 79 acres, in the Virginia district, three to four miles from Lordsburg, connected therewith by a good wagon road. Property has no surface improvements, and is opened by 478' of shafts, crosscut and open-cut, showing ores that have given average returns, from smelter shipments to El Paso, of 8% to 14% copper, 1% to 20% lead, 22 oz. silver and \$10 to \$20 gold per ton.

BAUMANN COPPER CO.**ARIZONA.**

Office: care of Geo. W. Johnson, president, Moline, Ills. Mine office: Humboldt, Yavapai Co., Ariz. Employs 14 men. Jules Baumann, general

manager; C. H. Dooley, secretary; J. E. Burneister, treasurer; W. H. Mackay, superintendent.

Organized Aug. 3, 1901, under laws of Arizona, with capitalization \$600,000, shares \$1 par. Commercial Trust Co., of Prescott, registrar and transfer agent. Annual meeting, first Monday in November. Lands, 25 claims, area 500 acres, unpatented, in the Agua Fria district, including the Swiss Girl mine. Country rocks are quartz-porphry and slate, principal veins occurring as fissures in quartz-porphry, with heavy gouge on footwall. Ores are cuprite, malachite and azurite above, with chalcopryite below, giving assays of 14% to 42% copper, from a trace to 312 oz. silver, and from a trace to \$33.50 gold per ton. Development is by 11 shafts, three of 208', 214 and 690', with 8 under 200' depth, and by tunnels of 50', 150', 200', and 305', with a total of 2,650' of underground openings. Equipment includes a 25-h. p. hoist, good for 1,500', an 80-h. p. boiler, 2-drill Sullivan air-compressor, 2 power drills and several small mine buildings. Management plans drifting and crosscutting from the 725' level of the Swiss Girl shaft, when that depth is reached. Management seems honest and capable, and the property is of considerable promise.

SOCIEDAD MINERA y FUNDICION DE

ARGENTINA.

BAUSCH y TIANL

Office, mine and works: Chilecito, Rioja, Argentina. Property includes the San Pedro, Mercedes and other mines, producing copper, silver, and lead. Has water and steam power and operates the "San Miguel" smelter.

BAXTER MINE

CALIFORNIA.

An idle prospect near the Bully Hill mine, Redding, Shasta Co., Cal.

BAY COPPER MINES, LTD.

Offices: 142, Palmerston House, London, E. C., Eng. John Robertson, managing director; W. R. Caldwell-Moore, secretary. Organized Jan. 24, 1902, with capitalization £35,000, shares £1 par; issued, £15,007. Claims to own an idle copper mine, but whereabouts of same not ascertained.

BAY HORSE COPPER MINING CO.

WYOMING.

Mine office: Riverside, Carbon Co., Wyo. W. G. Foss, superintendent. Lands, sundry claims, circa 12 miles south of Encampment, on which some little development work has been done.

B. C. MINE.

BRITISH COLUMBIA.

Described under title British Columbia Chartered Co.

BEAD LAKE GOLD-COPPER MINING & MILLING CO.

WASHINGTON.

Office: care of W. E. Allen, secretary, Stevens Point, Wash. Mine office: Newport, Stevens Co., Wash. Employs 6 men. B. F. Seeley, president; O. L. Smith, superintendent. Organized 1901 under laws of Washington, with capitalization \$3,000,000, shares \$1 par. Lands, 13 claims, area 267 acres, developed by a 2,065' tunnel, showing sulphide ore. Has steam power and air-compressor. Is exploring by diamond drill.

BEAN COPPER CO.

ARIZONA.

Letter returned unclaimed from former mine office, Gila Bend, Ariz.

BEAR CREEK MINING CO.

CALIFORNIA.

Office: 18 Naylor-Cox-Bldg., Terre Haute, Ind. W. R. McKeen, presi-

dent; A. W. Wright, managing director; Willard Kidder, treasurer; Henry C. Albrecht, secretary. Property is in Mariposa county, California. Idle.

BEAR GULCH MINING CO.**MONTANA.**

Office and mine: Twin Bridges, Madison Co., Mont. Alex. Johnson manager; Edson C. Baxter, superintendent. Property is the Mountain View group, carrying auriferous and argentiferous copper ores, opened by tunnel. Has steam power.

BEAR MOUNTAIN MINING & DEVELOPMENT CO.**WASHINGTON.**

Mine office: Colville, Stevens Co., Wash. C. G. Carruthers, superintendent. Has argentiferous and auriferous copper ore, opened by tunnel.

BEAR MOUNTAIN TUNNEL & MINING CO.**COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. H. H. Williams, superintendent, at last accounts. Has argentiferous and slightly auriferous copper ores, opened by tunnel, with water power.

BEATRICE MINING & MILLING CO.**MONTANA.**

Mine office: Elliston, Powell Co., Mont. D. G. Barringer, president; A. McNaughton, secretary and general manager; Abner Knapp, superintendent. Has ores of gold, silver, lead and copper, opened by tunnel. Has steam power.

A. K. BEATSON.**ALASKA.**

All business of the Latouche Mining Company is done in the name of A. K. Beatson.

BEAVER-CANON GOLD & COPPER MINING CO.**WASHINGTON.**

Mine office: Loomis, Okanogan Co., Wash. E. P. Gaillac, manager. Lands, sundry claims, circa 8 miles south of Loomis.

BEAVER CONSOLIDATED MINING CO.**UTAH.**

Merged, 1904, in Beaver-Harrison Mining Co.

BEAVER COPPER MINING CO.**WYOMING.**

Letter returned from former mine office, Downington, Carbon Co., Wyo., with notation "dissolved." Described in Vol. V.

BEAVER-HARRISON MINING CO.**UTAH.**

Office: 23 Eagle Block, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. J. J. Trenam, president and manager; E. H. Jacobs, treasurer; B. L. Corum, secretary. Organized 1904, with capitalization \$75,000, shares 5 cents par. Is a merger of the Beaver Consolidated Mining Co. and the Ben Harrison Gold & Copper Mining & Milling Co. Lands, 21 claims, area 385 acres, Beaver Lake district, one group being near the O. K. mine of the Majestic company, showing sundry fissure veins, opened by 2 shafts of 300' and 534', with about 2,000' of workings, showing a 10' ore body assaying 5% to 50% copper, and up to 10 oz. silver and \$7 gold per ton. Has steam power and an air-compressor with necessary mine buildings. Employs about 20 men. Property regarded as promising.

BEAVER LAKE COPPER CO.**PENNSYLVANIA.**

Mine office: Bloomsburg, Columbia Co., Pa. Has secured ores assaying 17% copper. Presumably idle.

BEAVER MOUNTAIN MINING CO.**ALASKA.**

Mine office: Sulzer, Prince of Wales Island, Alaska. Henry Miller, president, Geo. Comer, manager. Lands, sundry claims on the south side of Beaver Mountain, Hetta Inlet. Development is by tunnels, showing ore carrying copper, nickel and cobalt. Idle at last accouts, but resumption planned on a considerable scale.

BEAVER VALLEY COPPER CO.**IDAHO.**

Black Bird Copper-Gold Co. intended taking this title in 1903.

ECKLER RIVER GROUP.**WASHINGTON.**

Sold, circa 1904, to Apex Mining Co.

BEDÉ METAL & CHEMICAL CO., LTD.**SPAIN & NORWAY.**

Offices: Hebburn-on-Tyne, Eng. General Spanish offices: Manriques, 9, Córdoba, Spain. Sir Andrew Noble, K. C. B., F. R. S., chairman; W. W. Brown, secretary; Richard E. Carr, general mine manager; C. E. Turner, engineer. Organized 1871, with capitalization, £115,360, shares £10 par. Dividends for 1901 and 1902 were 5% each year. Is primarily a manufacturer of acids and chemical products, but secures a considerable amount of copper from the cinders of Spanish and Norwegian cupriferous pyrites. Principal mining property, area 136 hectares is Las Herrerias mine, at Puebla de Guzmán, Huelva, Spain, held under lease from C. & J. Sundheim, this including 7 mines, in two groups, and employing several hundred men. The main ore body is a large, irregular, mass of solid cupriferous iron pyrites, in schists, carrying average values of 1.5% copper and 47% sulphur. Main shaft is 235', the principal workings being open-cast, with two mineral floors, each about 16 meters in height. Has steam power and one locomotive. Ore, as mined, is placed in level-top piles, 6 to 8 meters high, in open air, and these are sprinkled systematically, the leach-water, carrying 2% to 2.5% copper, being drawn off through long, narrow channels, containing pig iron, and the resulting precipitate, averaging 70% to 80% copper, dried and shipped to the company's works in England for refining.

The Killingdal Kobbervaerk, in Norway, also is operated by the Bedé Company. Product is cupriferous iron pyrites carrying an average of about 2.5% copper. Production, 1904, was 1,128,960 lbs. fine copper from Spain and 654,080 lbs. from Norway, a total of 1,783,040 lbs.

BELCHER MINING CO.**WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. J. L. Harper, general manager. Mine is opened by three tunnels, of which No. 3, the 1,000' main tunnel, shows a large body of medium-grade ore carrying a 2' footwall paystreak of very high-grade chalcoppyrite. Is building a 1,000' aerial tramway, to connect the 3 main adits with railroad bins. Water, brought 2,000' from Lambert Creek, through a steel, pipe, generates electric power, and gasoline power is used also. Has 8 power drills. Property considered promising.

BELÉN MINING CO.**MEXICO.**

Office: 12 Chamber of Commerce, Minneapolis, Minn. Mine office: Cumapas, Sonora, Mex. Chas. E. Wenzel, president; John E. Stair, vice-president; Ace P. Abell, secretary and treasurer; T. B. Bassett, general manager. Or-

ganized circa May 20, 1901, under laws of South Dakota, with capitalization \$1,200,000, shares \$10 par. Lands, 217 acres mineral holdings, and circa 14,000 acres ranch and lumber lands. Active mining was begun in spring of 1905. Has 7 shafts and tunnels, showing a mineral ledge of 280' to 350' width, traceable about 7,500'. Assays have given values of \$36 to \$225 per ton, latter from a 30" vein in shaft No. 2. Has a steam and electric power plant running 2 electric hoists, electric drills and lighting mine and camp buildings. Wood is used for fuel. Company plans building a concentrator, tests having shown concentration of 3 into 1, with a value of about \$25 for concentrates from low grade ore, of which a large amount is available. Nearest railroad point is Nacozari. Mine has shipped some ore to the copper Queen smelter, at Douglas, but plans shipping 75 to 100 tons daily to the nearby smelter of the Transvaal Copper Co., which went into blast May 1, 1906. About 100 men are employed. Company seems well managed, and property is considered promising.

BELENE COPPER CO.**MEXICO.**

Office: 515 Bryan Bldg., Los Angeles, Cal. Mine office: El Copete, Sonora, Mex. J. J. Hardwick, president and general manager; Harry R. Hay, secretary and treasurer; Luis Killeen, assistant manager. Organized 1901, under laws of Arizona, with capitalization \$5,000,000, shares \$5 par; registered and protocolized in Mexico, June 25, 1902. Lands, 405 acres, in the Ures district, showing two large sulphide ore lenses, said to give average assays of 12% copper, 8 oz. silver and \$10 gold per ton. Has 9 shafts, of 65' to 310' depth, and 3 tunnels, of 40' to 200' length, with about 1,500' of underground openings. Plans to install steam and electric power and to build a smelter when nature of ores below water-line is developed. Smelter of Copete Mining Co is on lands of the Belene. Idle since circa 1903.

COMPAGNIE DE CUIVRE DE BELGIQUE.**BELGIUM.**

Office and works: 17, Quay Napoleon, Antwerp, Belgium. Employs 60 men. Marquis de Seine, chairman; Louis J. Burkard, commercial director; H. de Montagu, metallurgical director; Herman G. C. Thöfehrn, consulting engineer. Organized April, 1905, under laws of Belgium, with capitalization 500,000 francs, shares 500 f. par. A smelter, at Duffel, a suburb of Antwerp, and connected therewith by water, has a 250-ton blast furnace and five 100-ton reverberatory furnaces.

SOCIÉTÉ ANONYME BELGE POUR LA RECHERCHE ET L'EXPLORATION DES MINERAIS.**ITALY.**

Mine office: Massa Marittima, Grosseto, Italy. A Belgian company, operating a mine of slightly cupriferous iron pyrites.

BELL MINE.**MEXICO.**

Office: care of Robert Tate, manager, Bisbee, Ariz. Lands, sundry claims, circa 18 miles west of Fronteras, Sonora, Mexico, showing rich auriferous and argentiferous copper ores. Company planned making a small smelter shipment early in 1906.

BELL MINE.**MONTANA.**

Owned and operated by Anaconda Copper Mining Co.

BELL-DOMINION COPPER MINING CO.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Organized August 1904, with capitalization of \$250,000. Lands, 10 claims, known as the Scotch group, west of Pinal Creek. Has a 70' shaft and was sinking at last accounts.

BELLE OF GRANITE MINE.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, superintendent. Lands, sundry claims, developed by a 475' shaft, bottomed in a very narrow but rich vein, said to average about 32% copper, 28 oz. silver and \$120 gold per ton.

BELL MARE COPPER MINING & SMELTING CO.**NEVADA.**

Merged, 1902, in the Nevada Bell Copper Mining & Reduction Co.

BELLE MARSH MINE.**IDAHO.**

An idle prospect, near Pocatello, Bannock county, Idaho.

MINA BELLAVISTA.**MEXICO.**

Office: care of Henry L. Choistry, owner, Guadalajara, Jal., Mex. Mine office: Etzatlán, Jalisco, Mex. Lands, 14 pertenencias, just east of Etzatlán, showing 7 veins, two averaging 1 metre in width, slightly developed by about 95 metres of workings, showing argentiferous and auriferous copper ores. Property is an "antigua," formerly known as the Picachos.

BELMONT MINING CO.**COLORADO.**

Mine office; Winfield, Chaffee Co., Colo. Jas. Beuell, superintendent, at last accounts. Has gold-silver-copper ores, opened by tunnel.

BELMONT MINING CO.**MONTANA.**

Property sold, 1906, to Butte Coalition Mining Co.

BELMONT-CHEMUNG MINING CO.**COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Wm. Mitchell, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

BELT MINES.**MICHIGAN.**

Under option to the Lake Copper Co.

BEN FRANKLIN GOLD MINING CO.**WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. A prospect, showing auriferous copper ores. Presumably idle.

BEN HARRISON GOLD AND COPPER MINING & MILLING CO.**UTAH.**

Merged, 1904, in Beaver-Harrison Mining Co.

BEN HUR COPPER MINING CO.**WYOMING.**

Office: 710-34 South Clark St., Chicago, Ills. Mine office: Encampment, Carbon Co., Wyo. Employs 5 men. Chas. G. Mason, president; Clifford M. Miller, secretary and treasurer; N. C. Bowen, superintendent. Organized November, 1902, under laws of Wyoming, with capitalisation \$1,000,000, shares \$1 par. Lands, 4 claims, 3 undeveloped, area 80 acres, in the Battle Lake district, opened by a 350' tunnel, driving for a sulphide ore vein that outcrops at surface.

BEN HUR GOLD MINING CO.**WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. H. H. Hebert, president; J. Grier Long, vice-president; H. Bibbins, treasurer; S. P. Domer, secretary and manager. Employs 16 men. Plan to deepen main shaft to 500'. Has

steam power with 40-h. p. hoist and 60-h. p. boiler, and plans installing a heavier plant. At close of 1905 was producing about 25 tons of ore daily, shipped mainly to the Northport smelter, with a little silicious ore going to the Greenwood smelter for converter linings.

BENTON MINES.**CALIFORNIA.**

A group of 36 idle and slightly developed claims, in the White Mountains, 8 miles east of Benton, Mono county, California.

BEREHAVEN COPPER MINES, LTD.**IRELAND.**

Offices: 19, St. Swithins Lane, London, E. C., Eng. Mine office: Allihies, County Cork, Ireland. W. L. Boyle, chairman; H. T. Adams, secretary. Organized Jan. 28, 1902, with capitalization £200,000, shares £1 par. Debentures, £100,000 authorized, £41,500 issued, at 5%; also £50,000 second mortgage bonds at 5%. Idle.

BERLIN MINE.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Danl. Steel, superintendent. Lands, sundry claims north of the North Butte, opened by a 2-compartment shaft of 200' depth.

JOSÉ BERNARDINO.**MEXICO.**

Office and mine: Nombre de Dios, Durango, Mex. Is a small operator of local copper mines.

BERSBO COPPER WORKS.**SWEDEN.**

Is the smelting plant of the Aktiebolaget Atvidabergs Kopparverk.

SUCESIÓN NOEL BERTHIN.**BOLIVIA.**

Office: 74, Rue de Rennes, Paris, France. Mine office: Coro Coro, La Paz, Bolivia. Ange Berthin, agent. Property is a mine carrying cupriferous conglomerates, similar to those of the Lake Superior district, the copper occurring native. Has steam power and a smelter, employs about 350 men, and is the second largest copper producer of Bolivia. Production, 1903, was 2,028,232 lbs. fine copper.

BESA y CA.**CHILE.**

Office and mine: Chafaral, Atacama, Chile. Employs about 500 men. Edouardo P. Tellez, general manager. Property includes the Andacollo, Manto Verde and Ironton mines. Have steam power and smelter, shipping product as matte, securing an annual production equivalent to circa 2,500,000 lbs. fine copper.

BESSEMER IRON ASSOCIATION.**NEW MEXICO.**

Mine office: Hanover, Donna Ana Co., N. M. A. E. Dawson, lessee. Owns the Anson S. copper mine. Idle for several years.

BESSHI MINE.**JAPAN.**

Owned by the Sumitomo Copper Co.

BETTS COVE SULPHUR, COPPER & IRON CO.**NEWFOUNDLAND.**

Office: 32 Nassau St., New York. Mine Office: Betts Cove, Newfoundland. Was worked 1874-1884, and reopened by an adit in 1900, but since idle.

BETTS GAP COPPER MINE.**NORTH CAROLINA.**

Mine office: care of W. S. Adams, Savanna Creek, Jackson, Co., N. C.

Lands, 1,300 acres, in the Blue Ridge Mountains, carrying two veins, apparently averaging about 50' width and prospected for about 1,500' in length. Upper vein carries mainly disseminated chalcopyrite; lower vein mainly pyrrhotite, with prospect that these veins join at depth. Has 4 short tunnels, 2 shallow shafts and 20 drill-holes, with indications favoring possession of a large amount of low to medium grade ore. Assays average about 4.5% copper and \$1.60 gold per ton from chalcopyrite, the pyrrhotite showing nickel and traces of platinum. Owners are said to plan development upon a considerable scale.
BEULAH COPPER CO. **WYOMING.**

Dead. Supposedly absorbed by United Exploration Co.

BIG BONANZA MINE.

ALASKA.

On Latouche Island, about 60 miles from Valdez. Was said, October, 1904, to have been bonded for \$750,000, to F. August Heinze, with proviso that \$50,000 be expended immediately on development work.

BIG BUG GOLD & COPPER MINING CO.

ARIZONA.

Office: Byrne Bldg., Los Angeles, Cal. Mine office: care of Thos. C. Job, Prescott, Yavapai Co., Ariz. J. H. Canovan, president and general manager. Lands, 62 acres, in the Big Bug district of Yavapai county. Presumably idle.

BIG COLORADO MINING & MILLING CO.

COLORADO.

Mine office: Gladstone, San Juan Co., Colo. C. W. Bloodgood, manager, at last accounts. Ores carry gold, silver, copper and lead. Has electric and gasoline power. Presumably idle.

BIG COPPER CLAIM.

BRITISH COLUMBIA.

Office: care of Geo. B. McAulay, owner, Spokane, Wash. Mine office: Greenwood, Yale district B. C. Lands, at Copper Camp, 6 miles from Greenwood, are said to show a large amount of ore, of good grade.

BIG COTTONWOOD COPPER & GOLD MINING CO.

UTAH.

Office: 305 Auerbach Bldg., Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. Col. Nicholas Treweek, president and general manager; Joseph G. Fariss, secretary. Capitalization \$1,500,000, shares \$5 par. Has a 500' tunnel, showing ore bodies assaying 4% to 10% copper and up to \$3 per ton gold and silver. Installation of an electric plant is under consideration. Management is good, and property is regarded as above the average in promise.

BIG CREEK COPPER CO.

WYOMING.

Dead. Formerly had its habitat at Encampment, Carbon Co., Wyo.

BIG HORN MINING CO.

COLORADO.

Mine office: Pearl, Larimer Co., Colo. Has a 50' shaft, on the Copper Queen group, bottomed in a 5' vein claimed to assay 20% copper. Presumably idle.

BIG INDEX GOLD & COPPER MINING CO.

WASHINGTON.

Office: 419 Pioneer Bldg., Seattle Wash. Mine office: Index, Snohomish Co., Wash. Wm. Frankfort, president; J. C. Rathbun, secretary; Ed. E. Aegerter, superintendent. Organized 1902, under laws of Washington, with capitalization \$2,500,000, shares \$1 par. Lands, 15 claims, area 300 acres, 4 miles from a railroad, in the Washington district, opened by a 350' tunnel, showing ores giving average assay values of \$26 per ton, in copper and gold, principally latter. Presumably idle.

BIG INTERIOR MINE.

Mine office: Alberni, Vancouver Isld., B. C. Property is sundry claims in the interior of the island, 5,000' above sea-level, slightly developed and showing a strong outcrop of low-grade ore for nearly one mile.

BRITISH COLUMBIA.**BIG LEAD MINING & SMELTING CO.**

Office: Philadelphia, Pa. Mine office: Kelvin, Pinal Co., Ariz. Edwin L. Taylor, president; Wm. B. Twitchell, general manager. Lands, sundry claims adjoining the Ray mines, 5 miles from Kelvin, opened by shaft, said to show oxide and carbonate ores averaging 3.5% copper, with small gold and silver values. Sulphides are expected at depth. Completed a leaching plant in February, 1906, and is said to have leased the Bobtail mill and to have ordered a 100-ton concentrator.

ARIZONA.**BIG SHOW SILVER & COPPER MINING CO.**

Mine office: Twin Bridges, Madison Co., Mont. Organized under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Lands, 4 claims, showing auriferous and argentiferous copper ores.

MONTANA.**BIG YANK MINING & MILLING CO.**

Office: 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. J. C. Mattison, superintendent, at last accounts. Has auriferous and argentiferous copper ores.

OREGON.**BIGELOW GOLD & COPPER MINING CO.**

Letter returned unclaimed from former office, 49 Exchange Place, New York. Mine office: Hillsboro, Sierra Co., N. M. Wm. Buchanan, president and treasurer; J. H. Bigelow, secretary. Organized 1903.

NEW MEXICO.**BILBAINAS GROUP.**

Office: care of Aznar y Ca., owners, Bilbao, Spain. Mine office: Paimogo, Huelva, Spain. Property is the eastward extension of La Romanera group, and is considered promising.

SPAIN.**BILLION DOLLAR QUEEN MINING CO.**

A stock-jobbing scheme, promoted by a petticoat grafter called Mrs. Van Arsdale, née Estella Trunnell, alias Mrs. Estella True-Nell.

BI-METALLIC GOLD & COPPER MINING CO.

Said to have claims somewhere in Okanogan county, Washington, opened by tunnel.

WASHINGTON.**BINGHAM CENTENNIAL MINING CO.**

Succeeded, Feb. 11, 1904, by South Columbus Mining Co.

UTAH.**BINGHAM CENTRAL MINING CO.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Samuel Newhouse, president; Daniel C. Jackling, vice-president and general manager; Chas. W. Whitley, treasurer; Wm. M. Bradley, secretary; preceding officers, Edward B. Critchlow and Frederick A. Schirmer, directors. Organized under laws of Utah, with capitalization \$2,000,000, shares \$5 par. Lands, sundry claims, including the Davies and Gebhardt properties, lying between the Utah Consolidated and Boston Consolidated mines, in Bingham Canyon. Development is by 2 tunnels, the upper, known as the Whitley, and the lower as the Jeff Davis, latter cutting ore at 680'. Company is said to plan a bond issue, followed by

UTAH.

development on a considerable scale. Management is good and property is considered valuable.

BINGHAM-COCHISE COPPER MINING CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized January, 1906, under laws of Utah, with capitalization \$500,000, shares \$1 par. Lands include the Cochise and Brooks claims, in the Bingham district.

BINGHAM CONSOLIDATED MINING & SMELTING CO.

UTAH.

Offices: 60 State St., Boston, Mass., and 700 McCormick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Smelter office: Murray, Salt Lake Co., Utah. Edward L. White, president; W. S. McCormick, vice-president; W. J. Freeman, secretary; O. E. Weller, treasurer: preceding officers, J. M. Weeks, H. N. Sweet, J. A. Coram, Wm. Bayly, Geo. A. Baird, W. F. Hammett and L. T. Trull, directors; Duncan McVichie, general manager; B. W. Rogers, mine superintendent; W. H. Nutting, smelter superintendent; H. G. Heffron, purchasing agent and ore buyer. Organized April 5, 1901, under laws of Maine, as a reorganization of the Bingham Copper and Gold Mining Co., with capitalization \$10,000,000, shares \$50 par, non-assessable and fully paid. Bonds, \$1,000,000 authorized, at 6%. Annual meeting, third Wednesday in April.

Lands, circa, 300 acres, in the Bingham or West Mountain district, including the Dalton & Lark, Antelope, Brooklyn, Commercial, Miner's Dream, Sampson, Old Hickory, Vernard, Bingham and sundry other mines and claims. Company also owns an interest of 231,500 shares in the Tesora mine, of the Tintic district, and about 190,000 shares out of 250,000 in the Eagle & Bluebell Mining Co. The Bingham properties have a considerable variety of ores, principally sulphides, with gold and silver-lead values at and near surface, changing to auriferous and argentiferous chalcopryite at depth, later averaging 2.5% to 3% copper, with gold and silver values of about \$2 per ton. Some of the ore is rich in iron, hence desirable for fluxing, as most of the ores of the district are highly silicious and deficient in iron.

The Dalton & Lark mine has shafts of 850' and 1,150', the bottom level showing ore carrying 7% copper and 60 oz. silver. There also are 4 tunnels, one with an electric haulage plant. The Mascot tunnel, 7,000' long, drains the Dalton & Lark, Brooklyn and Miner's Dream mines. This tunnel, planned both for drainage and mining, should effect a saving of perhaps \$1 per ton in pumping and extraction costs. The Dalton & Lark ores average \$10.71 per ton in recoverable values, and the mine has about 250,000 tons of high-grade and 500,000 tons of low-grade ore in sight. All ore is handled by gravity, giving cheap working costs.

The Commercial mine has shown decided improvement since 1904, and at end of 1905 showed reserves of 500,000 to 1,000,000 tons of low and medium grade ore. These include considerable argentiferous galena, also low-grade auriferous and argentiferous copper ores carrying values of \$4 to \$5 per ton, with excess of iron, and mainly valuable for fluxing.

The Brooklyn mine, 1,600' deep, shows a vein of 20' to 25' width in the bottom levels, exposing a large tonnage of low and medium grade ore.

The Miner's Dream mine has been drained by the Mascot tunnel, and will be operated through that tunnel, which taps the ore bodies 600' lower than the bottom of the old workings.

The Sampson mine carries auriferous galena and auriferous and argentiferous chalcopyrite.

The Tesora, in the Tintic district, does not seem to have proven an especially valuable acquisition.

The mine of the Fortune Mining and Milling Co., at Bingham, is held under lease, and is a producer.

The Eagle & Blue Bell property is described separately, under name of company holding direct title.

The smelter, at Murray, 13 miles from the mine, was blown in January 31, 1901. The building is 150x400' in size, with steel frame on stone foundations, steel and cement floors and iron sides and roof, the only wood in the structure being the ore-bin partitions. Plant is terraced, allowing the handling of material by gravity. There are five 200-ton 42x172" water-jacket blast-furnaces and one large reverbratory furnace has been added, going into blast November, 1905. A new battery of calcining furnaces is being installed, and a briquetting plant has been built to handle fines. With these additions the smelter will have a daily capacity of fully 1,000 tons. The smelter has both steam and electric power, with a 1,000-h. p. Rarig blowing-engine, Stirling water-tube boilers and automatic stokers. The pyritic smelting system is used, ores being smelted to low-gradematte, and resmelted with silicious sulphides, producing a matte of 30% to 35% in tenor, which is blown up to blister copper averaging 98.35% in tenor and carrying average gold and silver values somewhat greater than the value of the copper itself. Adjoining the smelter building is a 375' dust chamber, with a 200' steel smokestack 12' in diameter. The conversion plant has 2 stands, with six 10-ton shells, 84x126".

The Bingham management planned building a lead stack and invading the general smelting field, but was persuaded by the American Smelting & Refining Co. to keep off the preserves of the latter, and was given profitable contracts to smelt the concentrates of the Utah Copper Co. and the Newhouse Mines & Smelters Corporation. The Bingham practically is in control of the custom copper smelting business of Utah, but soon is to have serious competition from the new Garfield plant of the American Smelting & Refining Co. The Bingham company is endeavoring, apparently with success, to put itself in a position to dispense with the custom business, and keep its plant busy on the ores of its own mines.

For 1905 the Bingham's production was 14,396,269 lbs. fine copper, 1,244,246 oz. silver and 29,153 oz. gold. The company is in a strong position as to mines and smelter, and should be able soon to gladden shareholders with the long-deferred dividends.

BINGHAM COPPER BOY MINING CO.

UTAH.

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Abram Hanauer, Jr., president; J. H. Hurd, secretary; W. A. Cooke, treasurer and general manager; J. B.

Taylor, superintendent. Organized February 19, 1901, under laws of Utah, with capitalization \$1,500,000, shares \$1 par. Annual meeting, first Monday in March. Lands, 12 claims, 11 patented, area 153 acres, also a 10-acre mill-site, in the West Mountain and Tooele districts, adjoining the Highland Boy mine of the Utah Consolidated, on the west. Property shows 3 veins of 20' to 40' width, giving average assays of 6% copper, 20% lead, 1.5% zinc 18 oz. silver and \$2.50 gold per ton. Ore on the dump shows 2% to 4.5% copper. Development is by an 800' crosscut tunnel and a lower tunnel of 2,000', with about 6,500' of underground openings, estimated by the company to put 1,500,000 tons of ore in sight. Company plans adding steam power and air-compressor, building a 300-ton concentrator, and installing electric power, during 1906. Underground development will be continued. Management is considered good and property regarded as promising.

BINGHAM COPPER & GOLD MINING CO.

UTAH.

Offices: 60 State St. Boston. Mass., and 700 McCormick Bldg., Salt Lake City, Utah. Is the parent corporation of the Bingham Consolidated Mining & Smelting Co., and presumably is kept alive for corporate purposes, as Twentieth Century corporation lawyers have discovered that a corporation never should be buried, no matter how dead it may become.

BINGHAM COPPER-GOLD MINING CO.

UTAH.

Mine office: Silver City, Juab Co., Utah. James Creighton, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power and a 100-ton concentrator.

BINGHAM-COPPER HILL MINING CO.

UTAH.

Office: care of Abram Hanauer, Jr., secretary, Salt Lake City, Utah. Henry P. Clark, president; Wm. M. Bradley, vice-president. Organized Dec. 20, 1905, under laws of Utah, with capitalization \$1,500,000, shares \$5 par. Lands, 5 patented claims, known as the Copper Hill group, adjoining the Congor. Considerable gophering has been done in the past, by shafts and tunnels. A 500' tunnel is to be extended circa 325', to tap anticipated ore bodies.

BINGHAM COPPER MINING CO.

UTAH.

Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Organized 1905, Lands include the Mary and Commonwealth claims.

BINGHAM & EASTERN COPPER MINING CO

UTAH.

Reorganized, 1903, as Bingham & Eastern Mines Co.

BINGHAM & EASTERN MINES CO.

UTAH.

Presumably dead. All letters returned. Described in Vols. IV and V.

BINGHAM GROUP MINING CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. Albert Booth, manager. Said to plan repairing the 3,000' Last Chance tunnel, preparatory to working the Greeley-Sacred claims.

BINGHAM MARY MINING CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah.

BINGHAM METAL MINING CO.**UTAH.**

Office: care of Clarence K. McCornick, president, Salt Lake City, Utah. Mine office: Tooele, Tooele Co., Utah. H. L. J. Warren, general manager. Lands, sundry claims, area 500 acres, in the Bingham field, 3 miles southwest of the Utah Copper Co., extending over the divide into Tooele county. It is thought that the cupriferous porphyries of Bingham Canyon extend to this company's properties, and it is planned to develop same through a tunnel, to be started in Middle Canyon, on the Tooele side.

BINGHAM-NEW HAVEN COPPER & GOLD MINING CO.**UTAH.**

Office: P. O. Box 84, New Haven, Conn. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs about fifty men. Louis E. Stoddard, president; N. M. Bradley, vice-president; Thos. W. Farnam, secretary and treasurer; Frank A. Taylor, general manager; Geo. H. Robinson, consulting engineer; C. H. Doolittle, superintendent. Organized October, 1902, under laws of Utah, with capitalization \$2,000,000, shares \$5 par. Bonds, \$200,000 authorized, \$78,250 issued, at 6%. Lands, 26 claims, area 500 acres, including the Zelnora mine, near the head of Carr Fork, adjoining the Highland Boy mine of the Utah Consolidated. Property shows three veins, occurring as fissures in porphyry and as a contact vein between porphyry and limestone. Main vein, 3' to 8' wide, between limestone and quartzite, carries 2% to 6% copper, 10% to 22% lead, 7% to 12% zinc, 2 oz. to 8 oz. silver and 40 cents to 80 cents gold per ton. Ores are chalcopyrite, galena and sphalerite. Mine has about 13,000' of underground openings, and has a tramway connecting with loading-bins on the Copper Belt railroad. Is equipped with electric power and air-compressor. Is shipping about 50 tons of ore daily to the Murray works of the American Smelting & Refining Co. Property seems well handled, and is considered valuable.

BINGHAM & SALT LAKE MINING CO.**UTAH.**

Letter returned unclaimed from former office, Salt Lake City, Utah.

BINGHAM WEST DIP TUNNEL CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Tooele, Tooele Co., Utah. F. M. Lyman, president; Milando Pratt, secretary; F. M. Bishop, treasurer. Capitalization \$100,000, shares one cent par. Lands, circa 520 acres, unpatented, opened by an 850' tunnel, planned to be driven 4 miles, from the Tooele side, through the Oquirrh range, to drain the entire West Mountain district, develop mineral bodies and provide water for the Tooele lands. Tunnel has cut several small ore bodies. Company said to be out of debt.

BIRTHDAY COPPER SYNDICATE.**TASMANIA.**

Lands, 510 acres, giving a fair showing of copper ore, near the coast and about 20 miles from Macquarie Heads, Tasmania.

BISBEE-ARIZONA DEVELOPMENT CO.**ARIZONA.**

Office and mine: Postoffice Bldg., Bisbee, Cochise Co., Ariz. M. R. Harlan, general manager. Lands, 14 claims, area 280 acres, in the Warren district, near the Modern mine, about 7 miles northwest of Bisbee, said by company to show 7 contact veins between limestone and porphyry, of which 2 veins, averaging 6' width, are claimed by company to give average assays of

6% copper, 40% lead and 40 oz. silver per ton. Development is by tunnels of 40' and 70' and by 5 shafts of 30' to 115'. Company expended about \$2,000 per month in development work, for several successive months, but the financial strain was too great. Idle since 1905.

BISBEE-ARIZONA GOLD & COPPER MINING CO.

ARIZONA.

Supposedly succeeded, circa 1905, by Bisbee-Arizona Development Co.

BISBEE BELLE COPPER CO.

ARIZONA.

Office: 401 Laughlin Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Arizona. Geo. M. Case, president; Geo. Van Derwerker, secretary. Organized under laws of Arizona, with capitalization \$1,250,000. Lands, 25 claims, in the Wickenburg district, opened by 4 shafts, deepest 150', and a 600' tunnel, showing ores giving assays up to 30% copper and \$2 gold per ton, with traces of silver, also sundry claims in the Warren district, Cochise county, Arizona, on which a 120' shaft was sunk, circa 1901. Idle for several years.

BISBEE CONSOLIDATED COPPER CO.

ARIZONA.

Office and mine: Bisbee, Cochise Co. Ariz. R. L. Samuel, president and general manager; Emil Marks, vice-president; F. A. Hess, secretary; W. J. Lewis, treasurer. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$5 par. Lands, 18 claims, area 360 acres, northwest of the Copper Glance, one-half mile from El Paso & Southwestern railway, in the Warren district, showing a heavy conglomerate capping over limestone, opened by a 200' shaft. Has steam power and a 54-h. p. hoist, good for depth of 1,500'. Idle for several years.

BISBEE COPPER DEVELOPMENT CO.

ARIZONA.

Office: care of Alfred M. Low, Detroit, Mich. Lands are the Union group, area 35.4 acres, in the Warren district of Cochise county, Arizona, held under bond and lease, on which \$40,000 has been paid and \$238,989.93 remained unpaid at last accounts, with stockholders engaged in litigation among themselves, at close of 1904. Presumably dead.

BISBEE GOLD & COPPER MINING CO.

ARIZONA.

Succeeded, Dec. 27, 1902, by Bisbee-Arizona Gold & Copper Mining Co.

BISBEE MINING CO.

ARIZONA.

Dissolved, 1904, with all debts paid.

BISBEE QUEEN DEVELOPING CO.

ARIZONA.

Office: care of E. E. Dennis, president, Grand Rapids, Mich. Mine office: care of Hoyal A. Smith, managing director, Bisbee, Cochise Co., Ariz. Organized April 20, 1903, under laws of Arizona, with capitalization \$1,000,000, shares, \$1 par. Lands, 27 claims, lying between the Portage Lake & Bisbee and Pittsburg & Hecla. Was reorganized, 1905, through purchase, by Hoyal A. Smith and associates, who intend allowing the land to lie idle, pending developments on adjacent properties.

BISBEE-QUINCY COPPER MINING CO.

ARIZONA.

Office: 503 H. W. Hellman Bldg., Los Angeles, Cal. Frank A. Leibert, president; Thos. Barkley, secretary. Organized 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 33 claims, near Don

Luis, in the Warren district of Cochise county, Arizona. Idle for several years.
BISBEE & SUPERIOR DEVELOPMENT CO. ARIZONA.

Dissolved, 1904. with all debts paid.

BISBEE-WEST COPPER MINING CO. ARIZONA.

Office: 345 Wilcox Bldg., Los Angeles, Cal. Mine office: Bisbee, Cochise Co., Ariz. Fred L. Dwight, president and general manager; D. F. McGarry secretary; C. H. McGonegal, treasurer. Organized October 25, 1899, under laws of Arizona, with capitalization \$4,000,000, shares \$1 par. Lands, circa 440 acres, in the extreme western part of the Warren district, opened by shafts of 500' and 750', with considerable underground development. Mine was very wet and no ore bodies were encountered. Location considered too far west of the Bisbee field. Out of funds and idle for several years.

KUPFERERZ GEWERKSCHAFT BISMARCK. GERMANY.

Office and mine: Hanover, Braunschweig, Germany. Organized Nov. 20, 1899. Property is various copper and iron mines, former including the Morgenrothe in Brunswick, and the Rothbart in Prussia, carrying malachite and other copper ores, the iron ore mines being near Ruhla, Saxe-Weimar.

BISMARCK-NUGGET GULCH CONSOLIDATED MINING CO. MONTANA.

Bankrupt, and property sold by sheriff, 1905.

BISON MOUNTAIN MINING CO. MONTANA.

Mine office: Elliston, Powell Co., Mont. Ores carry gold, silver, copper and lead. Has steam power. Presumably idle.

BITTER MOUNTAIN MINING CO.

Moribund. Started as a copper mining company, but found no copper.

BITTER ROOT COPPER MINING CO. MONTANA.

Lost its lands, circa 1904, through inability to meet bond payments.

B. K. MINE. AUSTRALIA.

A new property, in Queensland, Australia, on which development work is proving encouraging. A small production is being secured from opening work.

BLACK BAY MINING CO. ONTARIO.

Office: Willmar, Minn. G. P. Carwand, president; N. B. Carlson, secretary. Organized November 5, 1901, under laws of Arizona, with capitalization \$1,000,000. Lands, 3 crown-granted claims, area 266 acres, also 13 acres miscellaneous lands, all heavily timbered, in the Thunder Bay district of Ontario. Country rock is trap, showing 7 amygdaloidal cupriferous beds, claimed by company to average 2% native copper, 1.25 oz. silver and \$2 gold per ton. Idle at last accounts.

BLACKBIRD COPPER & GOLD MINING CO. IDAHO & UTAH.

Office: care of Chas. J. North, vice-president, 683 Ellicott Square, Buffalo, N. Y. Mine offices: Salmon, Lemhi Co., Idaho, and Frisco, Beaver Co., Utah. John E. Du Bois, president; L. A. Amsden, secretary and treasurer; Dr. P. A. H. Franklin, manager; Geo. S. Fitzwater, superintendent in Idaho; Peter M. McCrea, superintendent in Utah. Capitalization \$2,000,000; bonded debt, \$500,000. Lands, 33 patented claims, area 382½ acres, in the Blackbird district of Lemhi county, Idaho, from which small smelter shipments, returning 17% copper and \$8 gold per ton, have been made. Utah lands, 68 patented

claims, area, 1,165 acres, and 23 claims held by location, adjoining the Cactus mine of the Newhouse company, on which a large shaft has been started. Considerable development has been secured and the property is regarded as promising, especially the Utah holdings, on which nothing but the compulsory assessment work has been done since 1903. Company reports an actual cash investment of \$607,353.08 to Jan. 1, 1905.

BLACK BUTTE MINING & REDUCTION CO.

ARIZONA.

Office: Phoenix, Ariz. Mine office: Castle Creek Hot Springs, Yavapai Co., Ariz. T. Connell, president and treasurer; M. Thompson, secretary; J. C. Dobbins, general manager. Organized under laws of Arizona, with capitalization \$750,000, shares \$1 par; issued, \$350,000. Lands, 5 claims, area 102 acres, held by location, in the Castle Creek district, 26 miles from Santa Fé, Prescott & Phoenix railway, showing fissure veins in shales, 3 veins averaging 8' width carrying cuprite, azurite, malachite, chalcocite and atacamite, opened by a 220' tunnel and 170' shaft. Has steam power and necessary mine buildings. Development as yet is within the leached zone, atacamite being the predominant ore, this occurring in a pay-streak of 12" to 18" along the footwall and giving average assays of 34% copper. Idle.

BLACK CANYON COPPER CO., LTD.

ARIZONA.

Dead. Was a bad outfit. Lands have gone to Canyon Mining Co.

BLACK CHIEF MINE.

ARIZONA.

Letter returned unclaimed from former mine office, Dewey, Ariz.

BLACK COPPER CO.

NEW MEXICO.

Mine office: Elizabethtown, Colfax Co., N. M. A gold producer only.

BLACK DIAMOND COPPER MINING CO.

ARIZONA.

Office: care of E. D. Kennedy, treasurer and general manager, Warren, Ohio. Mine office: Pearce, Cochise Co., Ariz. J. G. Hearne, president; H. C. Christie, vice-president; Dr. T. M. Sabin, secretary; W. G. Barney, superintendent. Organized 1898, under laws of West Virginia, with capitalization \$2,000,000, shares \$5 par. Sold \$480,000 bonds, at 50 cents on the dollar. Lands, 35 claims, area circa 500 acres, 6 miles from Pearce, in the Cochise Mountains. Ores occur as contact veins between limestone and porphyry, with parallel dykes of sandstone and quartzite, having a heavy gossan capping, in places 150' wide. Ores are almost exclusively sulphide, being mainly chalcopyrite and bornite, with iron and silica gangue, estimated to average better than 6% copper, 10 oz. silver and \$1.40 gold per ton, with about 38% silica. Property was opened originally for silver. Development is by 4 tunnels, lowest 600' below crest of the hill, tunnels being connected by winzes. Mine is connected with smelter by a 1½-mile Leschen aerial tramway, having a drop of 800', with 600 tons daily capacity. Has a pumping plant with 4" pipeline, installed at Pearce, this having capacity to raise 100,000 gallons daily against a head of 804' in 6 miles, with a 350,000-gallon storage reservoir at the mine. Property has a good steam equipment, including two air-compressors with 15-drill capacity, petroleum being used for fuel. Miscellaneous improvements include a 20-room hotel, store, schoolhouse and a considerable number of dwellings. A 200-ton smelter, built 1902, has a 44x120" Allis-Chal-

mers rectangular water-jacket blast-furnace, a 38" auxiliary cupola and a 24x36' circular roaster, and made a matte carrying about 65% copper, and 150 oz. to 300 oz. silver per ton, with small gold values. Ores are self-fluxing, and easily smelted, and furnace is claimed to have shown slag losses of only 0.3% copper. Company came to grief financially, and was practically reorganized and management changed. Work was resumed in fall of 1905, and 25 men were employed at close of year, when it was planned to resume smelting early in 1906.

BLACK DIAMOND MINING & DEVELOPMENT CO. WYOMING.

Office: care of Perry F. Powers, Cadillac, Mich. Presumably idle.

BLACK DIAMOND TUNNEL CO. BRITISH COLUMBIA.

Office: 604 Land Title Bldg., Philadelphia, Pa. Mine office: Ainsworth, Kootenay district, B. C. Maxwell Stevenson, president; Henry M. Stevenson, secretary. The Highlander tunnel, having a total length of about 3,000', has cut three veins of 4' to 13' width, giving fair assays in silver, lead, copper and gold. Although the officers of the company were claimed to stand well locally, the company was a mere stock-jobbing scheme. Idle for several years and apparently moribund.

BLACKFOOT COPPER CO. MONTANA.

Succeeded, 1901, by Imperial Montana C. M., S. & W. P. Co.

BLACKFOOT MINING & MILLING CO. WYOMING.

Property supposed to be in vicinity of Battle, Carbon county, Wyoming.

BLACK FOREST GROUP. NEVADA.

Office and mine: care of C. M. Spence, owner and manager, Wells, Elko Co., Nevada. Ores carry copper, gold, silver and lead. Has water power and a small smelter. Presumably idle.

BLACK HAWK MINE. ARIZONA.

Mine office: Globe, Gila Co., Ariz. Lands, sundry claims near Globe, claimed to show a vein 40' wide at surface, averaging 9% copper and 2 oz. to 8 oz. silver per ton, which, of course, is a great exaggeration.

BLACK HILLS COPPER CO. SOUTH DAKOTA.

Office: Benton Harbor, Mich. Mine office: Rochford, Pennington Co., S. D. John E. Barnes, president; George M. Thresher, secretary; John Robinson, treasurer. Organized June 2, 1900, under laws of South Dakota, with capitalization, \$2,000,000, shares \$1 par. Lands, 27 claims, area 510 acres, in the Hornblende district, showing fissure veins in slate, with heavy gossan capping, carrying carbonate and oxide ores. The ore body under development is said by company to average 20' width, and to be more than a mile in length, opened by incline shafts of 800', 40' and 75', with crosscut tunnels of 65' and 300', giving a total of about 1,200' of underground openings. Ores average 1.5 to 3% copper, with small values in gold, silver and nickel, and a carload shipment of carbonate ore gave smelter returns of 16.31% copper. Has steam power, with 60-h. p. hoist, good for 1,500', and 4 power drills. Presumably idle.

BLACK HILLS COPPER CO., LTD. ARIZONA.

Office: 232 Fifth Ave., Pittsburg, Pa. Mine office: Jerome, Yavapai

Co., Ariz. Employs 16 men. R. A. Thomas, president; Peter Boyd, vice-president; F. J. LeMoyne, secretary and treasurer; Ed. Beven, superintendent. Organized July, 1899, and reorganized May 20, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Union Trust Co., Pittsburg, registrar; Colonial Trust Co., Pittsburg, transfer agent.

Lands, 15 claims, 6 patented, area 280 acres, in the Verde district, opened by shafts of 212' and 550', with tunnels of 60' and 90', with about one-half mile of openings. Main shaft, at 382', cut a stringer of ore assaying up to 13% copper and 3 oz. silver. Has a 280-h. p. steam plant, with 125-h. p. tubular high-pressure boiler, duplex pump, hoist and power drills. Old management kept property free of debt. New blood was secured, and work resumed August 20, 1905. It is planned to sink the main shaft to depth of 1,000', then crosscut and drift from that level, which is an eminently business-like program. Property lies between the United Verde and Equator mines, and is well regarded.

BLACK HILLS COPPER MINING CO.

Office: 310-73 Tremont St., Boston, Mass.

BLACK HILLS & DULUTH COPPER MINING CO.

SOUTH DAKOTA.

Mine office: Custer, Pennington Co., S. D. F. A. Towner, president; M. J. Bailey, secretary; W. F. Hanley, treasurer; W. A. Nelson, superintendent. Capitalization, \$3,000,000, shares \$1 par. Lands, 340 acres, 8 miles northwest of Custer, adjoining the Central Black Hills Copper Co., showing promising outcrops of argentiferous and auriferous copper ores, which have given assays up to 20% copper, slightly developed by 2 shafts. Has water power. Idle.

BLACK HILLS GOLD & COPPER MINING CO.

ARIZONA.

Office: care of R. H. Burmister, general manager, Prescott, Yavapai Co., Arizona. Property is in the Black Hills of Yavapai county. Idle.

BLACK JACK MINE.

UTAH.

Office: care of Jesse Knight, owner, Provo, Utah. Letter returned unclaimed from former mine office, Park City, Summit Co., Utah. Mine has considerable development, showing horn silver and copper ore up to 6% in tenor.

BLACK MARIA & SILVER BELLE MINES.

IDAHO.

Mine office: Mineral, Washington Co., Idaho. Mine is opened by tunnel and shaft. Ores carry copper and silver. Has steam power and a 20-ton smelter. Presumably idle.

BLACK MOUNTAIN MINING CO.

MEXICO.

Office: 135 Adams St., Chicago, Ills. Mine office: Magdalena, Sonora Mex. Wm. Z. Stuart, president and treasurer; F. S. Sensenbrenner, secretary; N. C. Banks, general manager; Phillip N. Moore, consulting engineer. Organized 1904, with capitalization \$2,000,000, shares \$5 par, as a reorganization of the Nogales Copper Co.

Lands include sundry copper claims in the Patagonia and Pajorita districts of Santa Cruz county, Arizona, described in Volume IV, but these will be allowed to remain idle for the present. Principal property is the Cerro

Prieto gold mine, 28 miles southeast of Magdalena, and connected therewith by a good wagon road. Lands carry about 3 miles of the Cerro Prieto vein, outcropping 7' to 100' in width. The ore body is a low grade auriferous quartz-porphyry, giving assays of \$4 to \$12 gold per ton. The old mill on the property is said to have secured net returns of \$7 per ton. Mine is opened by tunnels, permitting cheap extraction. No. 8, the principal tunnel, is 1,700' long, with double tram-tracks and electric haulage plant, equipped with 4-ton cars, planned to handle 500 tons per 8-hour shift. Vein ranges 7' to 30' wide in this tunnel.

Power is generated at Magdalena and transmitted 28 miles to the mine. Reason for this long transmission is found in the hilly country, and the advantage of locating the power-plant on the railroad line. The Magdalena plant has an 8-acre site, adjoining the Southern Pacific railway. Equipment includes Westinghouse turbine engines, and the foundation is built for a plant of double the present size. There also is a 40x100' brick warehouse at Magdalena. Improvements at the mine include a 40x140' general store, 30x100' warehouse, 18-room hotel and 47 dwellings for workmen.

The first unit of the stamp mill at the mine was completed May, 1906, this has 120 stamps, operated throughout by electricity, and housed in a steel structure with cement foundations. It is, without doubt, the most modern gold mill in the world, and it is planned to ultimately increase its capacity to 480 stamps. Water is secured from a 40' well on the San Domingo river, and is forced by electric pumps through 15,000' of 8" pipe to the mill.

Some litigation, begun against the company early in 1906, seems to be founded on insufficient grounds. It was expected that the plant would go into operation about June, 1906. Management is good and property is considered very promising.

BLACK PEAK GOLD & COPPER MINING CO.

NEW MEXICO.

Lands, 6 claims, in Sierra county, New Mexico, with about 2,000' of development work, claimed to show about 5,000 tons of shipping ore. Idle at last accounts.

BLACK PRINCE COPPER CO.

ARIZONA.

Office: 506 Exchange Bldg., Denver, Colo. Mine office: Johnson, Cochise Co., Ariz. Benj. F. Woodward, president; Alex. Ross, treasurer; Thos. O. Ford, secretary; Robert McCabe, superintendent. Lands, 8 claims, 7 patented, area 167 acres, developed by several old incline shafts and a new 2-compartment shaft, circa 75' at close of 1905. Has shipped more or less ore, of good average grade, secured from development work.

BLACK RANGE COPPER MINING CO.

NEW MEXICO.

Office and mine: Fairview, Sierra Co., N. M. Organized January, 1906, with capitalization \$1,250,000, shares \$1 par, by B. S. Phillips, et al.

BLACK ROCK COPPER CO.

H.

Has lands in the Beaver Lake district of Beaver county, Utah, on which work has been in progress since 1904, showing ore assaying up to 36% copper with small gold and silver values.

BLACK ROCK GOLD & COPPER MINING CO.**ARIZONA.**

Office: Kankakee, Ills. Wm. D. Powell, president; Frederick S. Breen, secretary and treasurer; M. W. Breen, fiscal manager. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 20 claims, area 400 acres, in 2 groups, in Yavapai county, Arizona, one of these claims lying about four miles from the United Verde and the other lying about 20 miles south of the United Verde. Upper group is opened by a 150' two-compartment shaft, said to show a vein of 4' to 8' width, lower group has shafts of 60' and 75'. Assays of ore are said to run from \$15 to \$80 per ton. Officers are men of good standing, but company's prospectus contains a number of misleading statements. Presumably idle.

BLACK ROCK MINING CO.**ARIZONA.**

Office: care of R. C. Vincent, president and manager, Superior, Wis. Mine office: Wickenburg, Maricopa Co., Ariz. Lands, 9 claims, area 180 acres, in the Bradshaw Mountains, 17 miles from rail connection at Wickenburg. Country rocks are granite and syenite, showing 4 fissure veins, averaging about 30' width, carrying copper, lead, gold and silver, with quartz gangue, and also showing porphyritic dykes carrying low-grade ores. Development is by several shallow shafts and short tunnels. Has gasoline power. Fred H. Perkins, former superintendent, is accused by management of having misappropriated company's funds. Idle.

BLACK ROCK MINING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Property is the Black Rock mine, in the eastern part of Butte, held under 3 to 5 years' lease. Main shaft, 400'.

BLACK TIGER COPPER MINING CO.**WYOMING.**

Dead. Property lost.

BLACK TIGER MINE.**COLORADO.**

Mine office: Red Cliff, Eagle Co., Colo. J. F. Fleming, superintendent. Has ores carrying gold, silver and copper, opened by tunnel.

BLACK WARRIOR COPPER COMPANY, AMALGAMATED.**ARIZONA.**

Reorganized, 1905 as Warrior Copper Company.

BLACK WARRIOR GROUP.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Alberni, Vancouver Island, B. C. Owned by A. Watson, et al. Is slightly developed by tunnel and open cuts, giving ore assaying 15% copper, \$3 silver and \$2 to \$12 gold per ton. Idle for several years.

BLANCHE COPPER MINING CO.**WYOMING.**

Office: 432 Omaha National Bank Bldg., Omaha, Neb. Mine office: Encampment, Carbon Co., Wyo. H. E. Owen, president; Jas. H. Kyner, secretary; Arthur H. Crow, general manager. Organized April 2, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, near the New Rambler, on which a slight amount of development work is claimed to show two veins, one of which, 3' to 5' wide, is claimed to show auriferous oxide, carbonate and sulphide ores. Has steam power. Idle at last accounts.

BLANCHE MINE.**NEW MEXICO.**

Office and mine: Organ, Donna Ana Co., N. M. Idle.

BLAND MINE.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Powers, Clark & Heck, owners. Has a tunnel showing ores carrying copper, silver and gold. Idle.

BLAYNEY MINING & SMELTING CO.**AUSTRALIA.**

Mine office: Blayney, N. S. W., Australia. S. Remfry, manager. Capitalization £100,000. Lands, 50 freehold claims, including the mine variously known as the Blayney, Great Blayney and Annandale, reopened 1897, by the present owners. Has a 40' vein, carrying chalcopryrite disseminated in andesite, opened by a 390' shaft. Has steam power and a 50-ton smelter, with a 2 water-jacket furnaces. Produced 418 long tons of copper from 18,666 tons of ore smelted, in 1901.

BLEDSOE GOLD MINING & LEACHING CO.**COLORADO.**

Mine office: Kokomo, Summit, Co., Colo. Henry Pomeroy, superintendent, at last accounts. Ores carry gold, silver, lead and copper.

BLINMAN COPPER MINING CO.**AUSTRALIA.**

Property sold, 1902, to Tasmanian Copper Co., Ltd.

BLUE ACRE COPPER CO.**UTAH.**

Office: 409 Dooly Blk., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Blueacre, Beaver Co., Utah. Henry M. Crowther, president and general manager; Wallace W. Wait, vice-president, secretary and treasurer. Capitalization \$600,000, shares \$1 par. Lands, 17 claims, area 320 acres, in the Beaver Lake district, showing 5 contact and fissure veins, of which three, of good average width, are being developed, these carrying values estimated by management at 6% copper, 5 oz. silver and \$4 gold per ton, from oxide, carbonate and sulphide ores, opened by 4 shallow shafts. Property regarded as promising, though but slightly developed, and work not being pushed with vigor.

BLUE BELL-BELCHER MINING CO.**WASHINGTON.**

Office: care of C. E. Mitchell, Spokane, Wash. Mine office: Republic, Ferry Co., Wash. Organized 1906, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Lands, sundry claims, known as the Blue Bell group, carrying 3,000' of the northwest extension of the Belcher vein.

BLUE BELL COPPER MINING CO.

Office: 36 Swiss St., Cleveland, Ohio. Moribund.

BLUE BELL MINING CO.**CALIFORNIA.**

Office: care of J. J. Sullivan, Quincy, Cal. Lands, sundry claims near Hosslekuss's, Plumas county, California. Idle.

BLUE BIRD COPPER-GOLD MINING CO.**UTAH.**

Office: care of M. J. True, secretary and general manager, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Lands are near the Hickory group of the Majestic company. Main shaft, 275'. Property thought to be valuable, but company in sore financial straits, at last accounts. Idle.

BLUE BIRD MINING & SMELTING CO.**WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Presumably idle.

BLUE CAP MINING & MILLING CO.**WYOMING.**

Office and mine: Casper, Natrona Co., Wyo. Theo. Becker, president; Donald Mitchie, vice-president; E. Percy Palmer, secretary and treasurer; Wm. S. Cook, superintendent. Capitalization \$5,000,000, shares \$1 par. Lands, in the Casper Mountains, are being developed by a shaft, from which rich copper specimens have been secured.

BLUE CREEK COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, Spokane, Wash.

BLUE GROUSE CLAIMS.**BRITISH COLUMBIA.**

Lands, sundry claims adjoining the Yreka mine, on the southwest.

BLUE HILL MINE.**MAINE.**

An old and idle property at Blue Hill, Hancock county, Maine.

BLUE JACKET CONSOLIDATED COPPER CO.**IDAHO.**

Office: 20 Broad St., New York. Letter returned unclaimed from former mine office, Decorah, Washington Co., Idaho. Lands, 295 acres, opened by a 250' shaft. Is said to have produced \$200,000 in copper, with smelter returns up to 47% copper. Property was bonded to Col. Geo. W. E. Dorsey, who failed to pay his men, and came to grief.

BLUE JACKET MINE.**IDAHO.**

Mine office: care of Frank E. Johnesse, operator under bond and lease, Grangeville, Idaho Co., Idaho. Lands, 4 unpatented claims, area 75 acres, showing 2 contact veins, of great width, assaying 4% copper, 7 oz. silver and \$4 gold per ton. Ores are oxides near surface and sulphides at depth. Shafts, 100' to 300' deep, with 1,000' of underground workings. Has gasoline power.

BLUE JAY EXTENSION MINING CO.**UTAH.**

Office: 308 Templeton Bldg., Salt Lake City, Utah. R. E. Fowler, president; L. H. Gray, secretary and treasurer. Capitalization \$500,000, shares \$1 par. Lands, sundry claims in the Washington district of Beaver county, Utah, slightly developed, but considered somewhat promising.

BLUE JAY GROUP.**UTAH.**

Office: care of John Skewes, owner, Salt Lake City, Utah. Lands are in vicinity of Moab, Grand Co., Utah. Main shaft, circa 100', shows ore assaying up to 25% copper. Presumably idle.

BLUE JAY MINE.**CALIFORNIA.**

Letter returned unclaimed from former mine office, Redding, Shasta Co. Cal. Lands, 4 miles north of Redding and 3 miles from Keswick, show sulphide ores and a little native copper in a 300' vein, traceable 1,000', opened by a shallow shaft. Presumably idle.

BLUE JAY MINE.**NEVADA.**

Mine office: Yerington, Lyon Co., Nev. A. Pugh, superintendent, at last accounts. Is slightly developed by shaft and tunnel. Has steam power.

BLUE JAY MINING CO.**CALIFORNIA.**

Mine office: Letcher, Fresno Co., Cal. Idle.

**BLUE LAKE GOLD & COPPER MINING,
SMELTING & POWER CO.****WASHINGTON.**

Office: 302-82 Wisconsin St., Milwaukee, Wis. Letter returned unclaimed from former mine office, Conconully, Okanogan Co., Wash. C. T. McElroy, secretary and general manager. Organized circa 1902, with capitalization \$3,000,000, shares \$1 par. Claims to have 6 veins, of 1' to 3' width, giving assays of 3% to 49% copper and \$3 to \$11 gold per ton. Lied atrociously in its prospectus. Apparently a dead duck.

BLUE LEDGE COPPER CO.

Office: 71 Broadway, New York.

BLUE LEDGE COPPER CO.

Office: Prescott, Ariz. Organized, 1904, with capitalization \$4,000,000.

BLUE LEDGE COPPER CO.**OREGON.**

Dead. Formerly owned the Blue Ledge mine, at Applegate, Oregon.

BLUE LEDGE MINE.**CALIFORNIA & OREGON,**

Office: care of L. F. Cooper, Crescent City, Cal. Mine office: Watkins, Jackson Co., Ore. Employs 40 men. F. W. Carnahan, superintendent. Said to have been sold, early in 1906, to Robert S. Towne and others, of New York, for \$175,000. Lands, 24 claims, area circa 440 acres, on the divide between Joe and Elliott creeks, two upper tributaries of the Applegate river, showing a 20' contact vein, between white and black mica-schists, opened by 3 tunnels of 80', showing chalcopryite and a little native copper, giving average assays values of 4% to 5% copper and 8 oz. silver per ton. Property also has been diamond-drilled, and has a number of open-cuts. Lands are well timbered and water power is available. Property regarded as promising.

BLUE MOUNTAIN COPPER MINING CO.**COLORADO.**

Lands sold, circa 1906 to Michigan & Colorado Mining & Milling Co.

BLUE RIDGE COPPER CO., INC.**NORTH CAROLINA & VIRGINIA.**

Office: 613-145 La Salle St., Chicago, Ills. Mine office: Marksville, Madison Co., Va. Jacob Lauth, president; Frank L. Race, secretary and treasurer; Harvey V. Hall, general manager. Organized April 2, 1904, under laws of Virginia, with capitalization \$500,000, shares \$5 par. Lands, circa 100 acres, on the eastern slope of the Blue Ridge Mountains, 10 miles from Norfolk & Western railway, opened by old pits and a 60' shaft. Lode is said to be a contact vein between granite and metamorphosed slate, carrying native copper, cuprite, malachite and azurite. Has 72-h. p. steam plant, and necessary mine buildings.

BLUE RIDGE COPPER MINING CO.**NORTH CAROLINA.**

Letter returned unclaimed from former mine office, Gap Creek, Ashe Co., N. C. Lands, 30 miles from nearest railroad, are said to show a 12" fissure vein, carrying a considerable variety of auriferous copper ores.

BLUESTONE MINE.**NEVADA.**

Mine office: Yerington, Lyon Co., Nev. Reported sold, 1904, to Capt. J. R. De La Mar, for \$125,000. Report not verified.

BLUE WING COPPER CO.**NORTH CAROLINA.**

Dead. Succeeded by Boston & Carolina Copper Mining Co.

BLUE WING MINE.**NORTH CAROLINA.**

Mine office: Baker City, Granville Co., N. C. Was owned formerly by the Blue Wing Copper Co., and later by the Boston & Carolina Copper Mining Co. Never successful, owing to bad management. Has several shafts, of 100' to 317' depth, with 4 levels opened from main shaft, these showing extensive bodies of disseminated bornite, with gangue of quartz and calcite. No stoping has been done below the 150' level. Idle for several years.

GEWERKSCHAFT BOBERTHALER ERZBERGWERKE. GERMANY.

Mine office: Kupferberg, Schlesien, Germany. Dr. Kossman, manager Organized June, 1902. Production, 1902, was 176,368 lbs. fine copper. Employed 21 men, at last accounts.

BOBTAIL MINES CO.**ARIZONA.**

Dead. Lands now held by Big Lead Mining & Smelting Co.

BOCCHEGIANO MINE.**ITALY.**

Owned by Societa Anonima delle Miniere di Montecatini.

KONIGLICHE HÜTTENVERWALTUNG BODENMAIS.**GERMANY.**

Mine office: Bodenmais, Bavaria, Germany. Ores are iron and copper pyrites, and products are blue vitriol and copperas. Employs about 80 men.

SOCIÉTÉ MINIERE DE BOGOSLOVSK.**RUSSIA.**

Office: 18, Theatre Place, St. Petersburg, Russia. Mine office: Bogoslovsk, Government of Perm, Russia. Employs 1,000 men. A. Hitrovo, chairman; N. I. Vladikin, general manager. Is a small portion of the Bogoslovsk Estate, owned by State Secretary A. Polovtsoff, principal business of the estate being the manufacture of iron, of which 75,000 tons of finished products are turned out annually.

Mines are in four groups, in a distance of three miles. Properties include the Vasilevsky, 600' deep; Bashmakovsky, 450' deep; Frolovsky, 750' deep, and the Bogoslovsky, 630' deep. These mines have been worked for upwards of a century.

Country rock adjoining the mine is limestone, of Lower Devonian age, through which have erupted granite and porphyry, mingled with tuffs, these overlaid by tentaculite slate, followed by an eruption of augite-garnet rock. The copper ores occur along the contact of augite-garnet with other rocks. Ore is chiefly chalcopyrite, associated with pyrrhotite, and occasional chalcocite, with calcite, quartz, garnet and augite gangue. In 1904 the largest ore body was a lense of 15x50x180'. The Vasilevsky was completely equipped with modern machinery, in 1904, but proved an expensive failure. Ore is hand-sorted on surface, and heap-roasted.

The smelting plant, near the mine, has four 48" Pils furnaces, of 28-ton capacity each; one 55-ton 42x144" Raschette furnace and two 18-ton 41x65" Raschette furnaces. All furnaces are of brick, without water-jackets. Fuel is inferior charcoal, made from pine and fir wood. Furnaces turn out matte of 22% to 35% copper tenor, slags averaging 0.3%. The matte is bessemerized to 98% blister copper, and refined in brick furnaces to 99.7% copper of excellent quality.

Costs of the Bogoslovsk average as follows, per ton of 2,000 lbs: Mining,

\$8.09; hand-sorting, 31 cents; roasting, 17 cents; matte smelting, \$2.12; bessemerizing, 89 cents; refining 20 cents; management, 35 cents; administration and miscellaneous, 95 cents; total, per ton of ore, \$13.08, equivalent to \$0.1378 per pound of refined copper.

Rock in the mines is phenomenally hard. In addition to mining and smelting, the management of the Bogoslovak lays out money liberally in a variety of ways, and for a variety of purposes other than of a business nature, these including expenditures for roads, schools, a mining college, geological museum, old people's home, charity, free medicines, hospital, etc. Management of the property is progressive. Production, 1903, was 2,749,789 lbs. fine copper.

BOHEMIAN RANGE COPPER CO.

MICHIGAN.

Office: care of Mathew Van Orden, treasurer, Houghton, Mich. Is a syndicate, formed to explore a tract of 960 acres, lying about $3\frac{1}{2}$ miles east of the Miskwabik. Surface trenching showed several amygdaloid beds. Has an 83' shaft, with 289' of drifts, on an amygdaloid bed about 8' wide. Geology of the property seems uncertain. Work was stopped June 15, 1905.

BOLAÑOS MINING CO.

MEXICO.

Office: care of M. M. Stephens, president, St. Louis, Mo. Mine office: Bolaños, Jalisco, Mex. W. C. Stith, president; C. W. Simmons, treasurer; Juan B. Yzabal, general manager; Walter R. Hazel, superintendent. Organized, circa 1904, to succeed the bankrupt Bolaños Mining & Milling Co. Management plans installation of hydro-electric power plant, on the Bolaños river.

BOLAÑOS MINING & MILLING CO.

MEXICO.

Reorganized, circa 1904, as Bolaños Mining Co.

COMPAGNIE DU BOLEO.

MEXICO.

Offices: 56, Rue de Provence, Paris, France. American office: 614 Sansome St., San Francisco, Cal. Mine office: Santa Rosalia, Baja California, Mex. Paul Mirabaud, chairman; Charles Laforgue, director-general; M. Demorest, secretary; Ernest Michot, mine manager; W. W. Rose, general mine superintendent. Organized May 16, 1885, under laws of France, with capitalization 12,000,000 francs, shares 500 f. par. Debentures, 1,782,000 francs, in bonds of 500f., bearing 4.5% interest. Dividends have been as follows: 62 francs, 50 centimes each for 1901 and 1902; 104 francs, 16 centimes, in 1903; 135 francs, 41 centimes, in 1904, and 200 francs in 1905. Company is supposed to be controlled by the French house of Rothschild. Enjoys, for a period of 20 years, ending Dec. 17, 1912, exemption from all federal and local taxes, except stamp taxes; exemption of employes from military and civil service, and exemption from customs duties and local dues, and for a term of 50 years, expiring 1942, is exempt from export duties on copper produced and import duties on fuel consumed. In addition to its own mines, the Compagnie du Boleo owns a considerable proportion of the stock issue of the Compagnie d'Inguaran.

Mineral lands are 11 groups, including 3 principal groups of mines known as the Soledad, Providencia and Purgatorio, also a promising new mine, known as La Bricas, and 11,920 hectares of grazing lands, south of the mines. The

ore occurs in a formation of Tertiary conglomerates, sandstones and tuffs, traversed at certain points by trachyte, the cupriferous tuffs overlying conglomerates of eruptive rock pebbles, and being surmounted by argillaceous tuffs all traversed by fissures. The ores are of great variety, including cuprite, melaconite, azurite, malachite, crednerite, chrysocolla, atacamite, covellite, and chalcocite. There are three cupriferous beds, of which the upper averages about 3' in thickness, the middle 2' to 3', and the bottom bed 2' to 10'. The middle bed carries oxide and carbonate ores in oolitic concretions, known locally as boleos, hence the name of the mine. The lowest bed is partly below the water-line, and carries sulphide ores, as well as oxides and carbonates. The ore is disseminated through the tuffs in thin, irregular veins, with clay gouge, and has a marked concentration toward the bottom of each bed, where the ore forms compact layers of 6" to 12". The main workings are 15 metres to 200 metres above sea-level, the mine being opened by numerous tunnels, and by 7 shafts of the following depths: Sombrero, 98 metres; Carmen, 53m.; Purgatorio, 55m.; Central, 156m.; Amelia, 48m.; Santa Rita, 86m.; San Juan, 86m. The mine is extensively developed, having about 125 kilometres of underground openings.

The mine has complete steam and electric plants, generating about 2,000 h. p. from steam engines, of which 1,500 h. p. is transformed by three-phase dynamos, for distribution to the various mines, and for the electric locomotives used. Owing to the peculiar nature of the mine, all drilling is done by hand, and the richness of the ore is such that no mechanical concentration is attempted, hand-sorting being deemed sufficient. The smelting plant, rebuilt, 1901, has eight 150-ton water-jacket furnaces. The ore is smelted to a matte of 58% to 65% tenor, and about one-third of the matte is reduced to black copper of 89% to 94% tenor, both matte and bars being shipped to Falmouth, England, for refining. German coal and coke are used for smelting and coal briquettes for general fuel. The average net copper return of ore smelted was 4.29% in 1900, 3.95% in 1901, 4.38% in 1902, and 3.97% in 1905. Ore is hand-sorted and machine-briquetted, at a cost of only one franc per ton, the argillaceous gangue serving as a natural binder.

The climate is tropical and the country is extremely arid. Potable water is secured by a pipe-line of 16,074 metres, from a reservoir on the Yaqui plateau, with pumps at Santa Aguede and Santa Rita. There also is a condensing plant, with 4 powerful pumps, for the distillation of sea-water. A private railroad, of 30 kilometres, connects the mines with the smelter at Santa Rosalia, the road having 9 locomotives and 120 cars. At the port of Santa Rosalia, opposite Guaymas, Sonora, is a town of 7,000 people, dependent solely on the mines and smelter. The company has a 340-metre jetty, and owns a sailing vessel of 350 tons register. Extensive harbor improvements are in progress, these including the construction of breakwaters of 650' and 2,500', also two new wharves. Miscellaneous enterprises include several general stores, a sawmill, four schools and a hospital.

Wages are \$1.25 per day, Mexican, for common labor, with free water and medical attendance, but owing to much higher wages being paid on the mainland, across the Gulf of California, the Boleo is suffering from a scarcity of labor,

and is working only 1,600 men, when 3,000 could be employed to advantage. A large number of Chinese coolies were hired, in 1903-1904, but only a few remained at the mines. Of 500 Japanese imported in 1904, only 40 remained at the mine at the close of the year, and the importation of tropical labor from Tepic also proved a failure. Production of fine copper has been as follows: In 1902, 10,953 metric tons, from 249,895 metric tons ore; in 1903, 10,480 tons copper from 230,490 tons ore; in 1904, 11,122 tons copper, and in 1905, 10,350 metric tons fine copper, equivalent to 22,817,610 lbs. avoirdupois, from 260,694 tons ore. The property is one of great merit, and is ably managed, under more than commonly trying circumstances.

BOLINAS COPPER MINING CO.**CALIFORNIA.**

Office: 253 Spear St., San Francisco, Cal. T. P. H. Whitelaw, president and manager. Lands, sundry claims, showing 9 veins, 6" to 2' wide, in serpentine, 4 miles northeast of Bolinas Bay, Marin county, California, on which considerable development work has been done. Ore on the dumps is said to carry 5% to 10% copper. Has a good equipment, including a concentrator. Idle at last accounts, and company refuses to furnish any statement.

BOMPA SYNDICATE.**AUSTRALIA.**

At last accounts was developing a copper property at Glasford Creek, Gladstone district, Queensland, Australia. Showing said to be promising, but district lacks railway connections, which must be had before successful mining can be done upon any considerable scale.

BONANZA CIRCLE MINES.**ARIZONA.**

A nickname for a group of mines at Bisbee, Cochise county, Arizona, which are under the same general management. Properties are described under their respective titles, companies in question being the Calumet & Arizona, Calumet & Pittsburg, Lake Superior & Pittsburg, Pittsburg & Duluth, Pittsburg & Superior American-Saginaw and Warren Realty & Development.

BONANZA COPPER CO.**NEW MEXICO.**

Mine office: Las Vegas, San Miguel Co., N. M. Chas. N. Petteys, president and manager; Geo. H. Hunter, secretary. Has steam power, a small concentrator and a 25-ton leaching plant.

BONANZA GROUP.**ALASKA.**

Owned by the Alaska Copper & Coal Co.

BONANZA MINING CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Fort Simpson, B. C. Lands were sundry claims in the Cassiar district.

BONANZA MINING CO.**MEXICO.**

Office: care of Chas. Sidlar, secretary, Sunbury, Pa. Mine office: Ameca, Jalisco, Mex. Hon. Thos. Savage, president; E. J. Callahan, general manager. Organized 1905, by shareholders of the Amparo Mining Co., to take over the Barranca mine, bought for \$30,000.

BONANZA MINING & SMELTING CO.**WASHINGTON.**

Office: 81 Sullivan Bldg., Seattle, Wash. Lands are the Edison group, 12 claims, in the Silver Creek district of Snohomish county, Washington, opened by tunnels aggregating 2,100' length, showing auriferous copper ores.

BONANZA MOUNTAIN GOLD MINING CO., LTD. BRITISH COLUMBIA.

Mine office: Grand Forks, Yale district, B.C. F. H. Knight, superintendent, at last accounts. Has low-grade auriferous and argentiferous copper ores. Idle.

BONANZA QUEEN MINING CO., LTD. WASHINGTON.

Office: Minneapolis, Minn. Mine office: Silverton, Snohomish Co., Wash. Richard H. Harehold, superintendent. Lands, 8 claims, showing 4 veins, carrying auriferous copper ores. Has about 1,200' of underground openings.

BONITO COPPER CO. ARIZONA.

Mine office: Safford, Graham Co., Ariz. Said to plan installing a leaching plant.

BONMAHON COPPER MINES DEVELOPMENT IRELAND.**SYNDICATE, LTD.**

Offices: Broad Street House, London, E.C., Eng. Mine office: Waterford, County Waterford, Ireland. Sir James Aloysius Power, chairman; H. J. Dixon, secretary; Alfred Thorpe, auditor; Arthur Llewellyn Pearce, consulting engineer. Organized Nov. 16, 1905, with capitalization £30,000, shares £1 par. Lands, 189 acres, on Bonmahon Bay, including the Knockmahon and Tankardstown mines. These properties were worked nearly 50 years, beginning 1824, and have an authenticated production, 1824-1865, of £1,339,232, from which profits of £543,011 are said to have been made. Ore won during this period is said to have averaged 10%, which either is an overestimate, or else was secured by very careful hand-selection. Property shows large reserves of low and medium grade ores, and is considered decidedly promising.

BONNER MINE. ONTARIO.

A group of idle claims on Michipicoten Island, Algoma, Ontario.

BONNEY MINING CO. NEW MEXICO.

Office: 117 East 18th St., Chicago, Ills. Mine office: Lordsburg, Grant Co., N. M. S. W. Maltble, president and general manager; J. B. Foster, secretary and treasurer. Lands, sundry claims, showing ores with values mainly in copper. Development was being delayed, at close of 1905, by non-delivery of machinery ordered. Said to plan building a 50-ton concentrator and reverberatory furnace, and installing electric power at the mine and reduction works.

BONNIE BELLE MINING & MILLING CO. WYOMING.

Dead. Had claims near the Ferris-Haggarty mine.

BOODLE MINING SYNDICATE, LTD. COLORADO.

Offices: 46, St. Mary Axe, London, E. C., Eng. Letters returned unclaimed from former mine office, Central City, Gilpin Co., Colo. John Peter Reid, chairman; Chas. Pearson, secretary; W. J. Richards, superintendent. Capitalization, £15,000; shares £1 par; issued, 7,500 shares, 15s. called up. Ores carry gold, silver, and copper. Idle for several years.

BORNITE COPPER CO. MONTANA.

Office: 150 Fifth Ave., New York. Mine office: Blackfoot, Teton Co., Mont. J. B. Holmes, president. Capitalization \$5,000,000, shares \$5 par. Is the successor of the Imperial Montana Copper Mining, Smelting & Water Power Co., which was the successor of the Blackfoot Copper Co. Presumably idle.

BORNITE COPPER & GOLD MINING CO.**ARIZONA.**

Letter returned unclaimed from former office, 16 State St., Boston, Mass. F. Rockwood Hall, president; Geo. D. Coleman, secretary and treasurer; W. G. Gates, superintendent. Lands are on Cram Mountain, Maricopa county, Arizona. Property idle and company insolvent.

BORNITE COPPER & GOLD MINING CO.**WASHINGTON.**

Office: care of C. W. Coffin, president, Bangor, Me. Mine office: Darrington, Snohomish Co., Wash. Wilbur E. Frank, secretary; C. G. Austin, general manager. Lands, 11 claims, in the Stillaguamish district, show large and promising outcrops of auriferous and argentiferous bornite and chalcopyrite. Development is by tunnel.

BORNITE COPPER & GOLD MINING CO.**WASHINGTON.**

Lands, 11 claims in the Stillaguamish district of Snohomish county Washington, carrying auriferous bornite and chalcopyrite. Was developing with considerable vigor at last accounts.

BOSSMO KISGRUBER.**NORWAY.**

Mine office: Bossmo in Ranen, Norway. Works ores carrying 0.5% and upwards in copper, and up to 50% sulphur, latter element furnishing the principal values. Production, 1902, was circa 24,000 tons of cupriferous pyrites.

BOSTON & ARIZONA CONSOLIDATED COPPER CO.**ARIZONA.**

Letters returned unclaimed from former office, 501-7 Water St., Boston.

BOSTON & ARIZONA COPPER CO.

Office: 131 State St., Boston, Mass.

BOSTON-ARIZONA GOLD & COPPER MINES CO.

Letters returned unclaimed from former office, 405-31 State St., Boston.

BOSTON-ARIZONA MINING CO.**ARIZONA.**

Office: 46 Broadway, New York. Letter returned unclaimed from former mine office, Morristown, Maricopa Co., Ariz. Henry Livingston Bowdoin, president; T. J. Smith, secretary; W. T. Smith, treasurer and general manager. Organized 1901, under laws of Arizona, with capitalization \$5,000,000, since reduced to \$500,000, shares \$1 par. Lands, 10 claims, area 200 acres, in the Vulture district, showing 6 fissure veins, of which two, averaging 4' to 20' width, are opened by three shafts of 20' to 50', and an 80' tunnel, showing oxide and carbonate ores giving assays of 1% to 40% copper, and \$1 to \$22 gold per ton, with a little silver and galena.

BOSTON & BRITISH COLUMBIA COPPER MINING & SMELTING CO.**BRITISH COLUMBIA.**

Practically dead. Lost title to property.

BOSTON & BRITISH COLUMBIA MINING CO.**BRITISH COLUMBIA.**

Office: 39 Cortlandt St., New York. Moribund.

BOSTON & BUTTE MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Gilbert, Arizona.

BOSTON & CAROLINA COPPER MINING CO.**NORTH CAROLINA.**

Property, the Blue Wing Mine, is idle, and company moribund.

**BOSTON CLIMAX GOLD-COPPER MINING
& INVESTMENT CO.****WASHINGTON.**

Office: Union Trust Bldg., Providence, R. I. Benj. F. Harrington, president and general manager. Lands, circa 240 acres, in Stevens county, Washington, on which about \$25,000 has been spent in development work. Idle.

BOSTON-COLBY COPPER MINING CO.

Office and mine: Saltese, Missoula Co., Mont. Employs 4 men. Joseph Spiekerman, president; Andrew Flaig, secretary, treasurer and general manager. Organized September 16, 1903, under laws of Montana, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, area 140 acres, also a 5-acre millsite, in the St. Regis section of the Coeur d'Alene district, not far from Saltese and rail connections. Has tunnels of 400' and 880', showing 5 ore bodies, which have given average assays of 15% copper, 10 oz. silver and \$5 gold per ton. Company plans sinking a 2-compartment shaft and installing steam or gasoline power.

BOSTON-COLORADO COPPER CO.**COLORADO.**

Office and mine: 124 F St., Salida, Colo. F. H. Colvin, president and general manager.

BOSTON-COLORADO COPPER MINING CO.**COLORADO.**

Letter returned unclaimed from former office, 50 White St., New York. Mine office: Fort Collins, Larimer Co., Colo. Edwin M. Keiser, president; Sanford Stark, vice-president and general manager; Roger C. Turner, secretary. Organized 1899, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 7 patented claims, area 63 acres, in the Howes Gulch district, showing carbonate and sulphide ores, giving assays of 7% to 8% copper, 1 oz. silver and \$2.60 gold per ton, developed by shafts of 40' and 240' and two 200' tunnels. Has steam power and necessary mine buildings. Presumably idle.

BOSTON & COLORADO SMELTING CO.**COLORADO.**

Office and works: Boston Bldg., Denver, Colo. C. C. Converse, president; Geo. D. Edmunds, secretary; Harold V. Pearce, manager. Has an extensive smelting plant and refinery, equipped with steam and electric power.

BOSTON CONSOLIDATED COPPER & GOLD MINING CO., LTD.**UTAH.**

Offices: 4, Great Winchester St., London, E. C., Eng. John E. Dudley Ryder, chairman; Samuel Newhouse, general manager; preceding offices, F. A. Schirmer, C. S. Henry, M. P., and M. I. Newhouse, directors; G. H. Johnson, secretary. Organized, May 14, 1898, capitalization increased August, 1905, to £625,000, shares £1 par. Debentures, £250,000, at 6%, redeemable at end of 5 years, on six months' notice, at £105, or convertible into shares at £2, the increase of £125,000 in capitalization providing for redemption of the £250,000 bond issue. Annual meeting, December 15. Shares listed on London and Boston Stock Exchanges. Property is held through an American company, the Boston Consolidated Mining Co., under which title the mine is described. Practically entire stock issue of the American corporation is held by the British parent company, and funds of the latter are loaned to the American company.

BOSTON CONSOLIDATED MINING CO.**UTAH.**

Office: 79 Milk St., Boston, Mass. Operating office: 608 Dooly Block,

Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Samuel Newhouse, president; F. A. Schirmer, vice-president, secretary and treasurer; Lafayette Hanchett, general manager; Louis S. Cates, general superintendent; S. H. Horner, mine superintendent; A. J. Bettles, mill superintendent; Geo. G. Wald, engineer. Organized under laws of New York, with capitalization \$1,000,000, shares \$100 par, entire capital stock, except founders' shares, being held by the Boston Consolidated Copper & Gold Mining Co., Ltd.

Lands, 51 claims, area 349 acres, patented, also a 200 acre millsite and 680 acres miscellaneous lands, in the Bingham or West Mountain mining district. Country rocks are limestone, porphyry and quartzite, and the ore is exclusively chalcopyrite. The property is really two mines in one. Original development was on fissure veins in the limestone and quartzite, when the work of the Utah Copper Co. led to investigation of the porphyry, and a monstrous mine is being developed thereon.

The mine as a whole has 261 tunnels, of 500' to 2,100' length, with a total of about 8 miles of underground openings, estimated to give 980,000 tons of ore in sight, with 675,000 tons blocked out for stoping, in the sulphide zone. There are 14 different known ore bodies in this zone, among the limestone and quartzite country rocks. Two veins are being developed, these having a generally East and West strike, and an average dip of 28° to the North. Width is estimated at 160' and length at 340', with unknown depth. The ores in this zone carry 2.5% to 3.75% copper, 1 oz. to 3 oz. silver and \$2 to \$5.60 gold per ton. Some of the best ore runs better than 10% copper, with corresponding increases in gold and silver values. Principal tunnels in this zone are the Work, Peabody and Armstrong No. 1. Latter is the main artery of the mine, on the sulphide zone, and has an electric haulage system, connecting at the portal with the Copper Belt railway. The Peabody tunnel shows a body of sulphide ore 190' in width, this being the largest vein of high-grade ore exposed in the Bingham district.

Another body 190' wide might be considered something to boast of, were it not dwarfed, almost to the point of insignificance, by the porphyry mine of the same company. This latter consists, not of a fissure, contact, or blanket vein, but of 110 acres of country rock—every ton of it ore for an unknown depth. The porphyry is monzonite, a somewhat complex anhydrous silicate of aluminum, sodium, potassium, calcium, manganese and iron. This is a continuation of the porphyry ore body first opened by the Utah Copper Co., and is opened by 13 different tunnels, of 50' to 843' length, with a total of about one mile of tunnels. Mr. Newhouse refers to this ore body as "inexhaustible." The term is a somewhat dangerous one to use, but its use never was more fully justified in mining matters, than in this case. The work already done has developed upwards of 30,000,000 tons of this ore, and the probable extent of the ore-body is variously estimated at 200,000,000 to 350,000,000 tons. Values are 1.5% to 2% copper, 0.5 oz. silver, and 0.03 oz. gold per ton. The fractional figures of the precious metals may appear insignificant, and might be so considered in the case of a small ore body, but inasmuch as they

represent about 30 cents silver and 60 cents gold, a total of 90 cents from each ton, the sum, multiplied by the mine's tonnage, represents several hundreds of millions of dollars. It is estimated by the management that copper can be made for 8.5c per pound, from the porphyritic ore, figuring gold and silver toward reducing the cost of the copper, which, at any normal market, would render the property reasonably certain to give \$2 to \$3 per ton profit upon the ore—a net future profit of anywhere from \$600,000,000 to \$1,050,000,000. The figures are dizzy, but the ore is there. It might be remarked, however, that it will take one to two centuries, if the mine be opened upon as large a scale as the greatest of the world's present copper producers, to grind up all the ore, and convert it into dividends, so stockholders must not grow clamorous for the entire profit immediately.

Mine equipment includes a 165-h. p. steam plant, with 30-h. p. hoist, 20-drill duplex Rand air-compressor, and 24 power drills. Mine buildings include a 30x45' carpenter shop, 25x45' machine shop, 2 smithies, office, laboratory, warehouse and various other small mine structures. An experimental 5-stamp mill is used for testing ores. The Copper Belt railroad connects with the mine's ore-bins, and the company has a 2½-mile standard-gauge private rail line, equipped with 5 locomotives and 50 dump cars. Two 95-ton Vulcan steam-shovels have been bought, and will strip the capping from the porphyry ore body.

The millsite, area 117 acres, with ample water supply, is at Bostonia, on Garfield Beach, upon the western shore of Salt Lake. It was at first planned to build a 500-ton concentrator, at a cost of about \$125,000, to reduce the ores developed in the sulphide zone, but the astounding developments on the porphyry zone compelled an entire change of plans, and a 3,000-ton mill is to be built, adjoining the 2,000-ton smelter of the American Smelting & Refining Co. This mill, of steel throughout, will be of the most modern construction and equipment, and will cost upwards of \$1,000,000, the parent company having raised £250,000 by a bond issue, to defray the cost of the new mill. It is probable that crushing will be done by stamps, rather than by rolls.

Production has been secured for several years, by ore shipments from the sulphide zone. In 1904 the mine made 3,223,836 lbs. fine copper and in 1905, circa 3,500,000 lbs. Average cost of mining was \$1.52 per ton. For the fiscal year ending Sept. 30, 1905, the company made a mining profit of \$172,158.13, with expenditures of \$23,596.10 for construction account, leaving a net profit of \$148,562.03 on the year's operations. The mine employs 125 men on the sulphide zone, and 100 on the porphyry workings. Production is 300 tons of ore daily, to be increased, upon completion of the new Garfield smelter of the American Smelting and Refining Co., to 800 tons daily. The full benefit of the 3,000-ton mill cannot be felt until 1908, by which time the Boston Consolidated should be producing daily about 3,000 tons of 1.75% to 2% porphyritic ore, and at least 1,000 to 1,200 tons of 3% to 3.5% ore from the sulphide zone, and making fine copper at the rate of between 40,000,000 and 50,000,000 lbs. yearly. The mine is one of magnificent capabilities, and the management seems fully alive to them, and fully competent to make the most of them.

BOSTON GOLD-COPPER MINING CO.**COLORADO.**

Dead. No complaint. Reorganized as Growler Copper Co.

BOSTON GOLD-COPPER SMELTING CO.**COLORADO.**

The smelter of this company, at Leadville, Colorado, is under lease, for a term of years, to the Republic Smelting Co.

BOSTON GROUP.**NEVADA.**

Office: care of J. K. Miller, owner, Colorado Springs, Colo. Letter returned unclaimed from former mine office, Reno, Washoe, Co., Nev.

BOSTON-IDAHO MINING CO.**IDAHO.**

Offices: 306-147 Milk St., Boston, Mass., and 3 First Natl. Bank Bldg., Ogden, Utah. Mine office: Nicholia, Lemhi Co., Idaho. R. P. Hunter, president and treasurer; Frank H. Clayton, vice-president and eastern manager; Ernest J. Waugh, secretary. Organized February, 1902, under laws of Utah, with capitalization \$500,000, shares \$1 par. Lands, 8 claims, area 100 acres, in the Spring Mountain district, developed by about 1,500' of underground openings, giving ores assaying from a trace to 27.5% copper, from a trace to 57% lead, 1 oz. to 40 oz. silver, and from a trace to \$1.60 gold per ton. Idle.

BOSTON & LAKE SUPERIOR COPPER MINING CO.**ONTARIO.**

Dead. Never very spry when alive.

BOSTON & MEXICO GOLD & COPPER MINING CO.**MEXICO.**

Office: 1006-294 Washington St., Boston, Mass. Mine office: Ameca, Jalisco, Mex. C. P. Winslow, president; John G. Peters, vice-president; Wm. H. Loughrey, secretary; Edwin Gilmore, treasurer; N. E. Everett, superintendent. Company plans to build a stampmill on its property, near Ameca.

BOSTON & MONTANA CONSOLIDATED COPPER & SILVER MINING CO.**MONTANA.**

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co. Mont. Works office: Great Falls, Cascade Co., Mont. Employs 3,000 men, of whom 2,000 are at the mines and 1,000 at the reduction works. Sidney Chase, president; John D. Ryan, managing director; David B. Hennessy, secretary and treasurer; preceding officers, A. B. Grafius and James Phillips, Jr., directors; Charles W. Goodale, general manager; John C. Adams, mine superintendent; A. E. Wheeler, smelter superintendent; Lee Hayes, engineer; Wallace Corbett, mine foreman.

Organized 1887, under laws of Montana with capitalization \$3,750,000, shares \$25 par. Debentures, \$200,000, at 7%, outstanding, being remainder of \$2,100,000 issued. Practically the entire stock issue is owned by the Amalgamated Copper Co. Dividends, to close of 1905, were \$44 525,000, of which disbursements in past 5 years have been as follows: \$5,250,000 in 1901; \$900,000 in 1902; \$1,200,000 in 1903; \$10,220,000 in 1904, and \$6,000,000 in 1905. Net earnings, for fiscal years ending June 1, have been as follows for 5 years, according to reports given the state of Montana: \$7,043,302 in 1901; \$1,639,695 in 1902; \$4,053,465 in 1903; \$4,574,498 in 1904, and \$5,855,620 in 1905.

The following table gives a summary of operations and results, for fiscal years ending June 1:

	1903	1904	1905
Tons ore extracted.....	907,227	988,866	1,138,347
Gross yield per ton.....	\$ 14.03	\$ 12.86	\$ 12.86
Cost of mining.....	2,368,982.25	2,921,952.00	3,317,810.13
Cost of mining per ton.....	2.16	2.90	2.90
Cost of transportation.....	907,227.00	988,866.00	1,138,307.00
Cost of reduction.....	2,767,042.00	2,501,830.98	2,515,146.89
Cost of reduction per ton.....	3.05	2.53	2.21
Paid for labor.....	2,824,814.00	2,921,952.00	3,433,860.56
Machinery and supplies.....	2,311,211.00	2,439,428.00	2,399,087.46
Marketing, refining and selling	2,634,180.00	1,795,538.00	1,808,029.37
Gross proceeds.....	12,730,899.00	12,720,282.00	14,634,923.46
Total expenditures.....	8,677,432.00	8,145,781.00	8,779,303.39
Net proceeds.....	4,053,467.00	4,574,498.00	5,855,620.07

Lands, 483 acres, in the Butte copper district, including working mines, developed but idle properties, prospected claims and undeveloped mineral lands. Also has part interests in various full and fractional claims in the district, and owns an extensive smelter at Great Falls, with valuable water-rights, and owns and operates coal mines at Sand Coulee, 16 miles from Great Falls. Principal mines of the company are the Leonard, Mountain View, Pennsylvania, West Colusa, East Colusa, Comanche, Moose and Badger. The ore bodies of the Boston & Montana are the richest and the mine is the best of the properties controlled by the Amalgamated Copper Co. The ores are notably rich in silver and gold, returning an average of 0.025 oz. silver, valued at 1½ cents, with silver at 55c per oz., and ¼ cent in gold, for each pound of copper produced. The mine has been opened to a depth of 1,875', showing excellent ore on the bottom levels, and it is altogether probable that values will hold to great depth. The ore mined gives average returns of a little better than 4% copper and \$1.50 to \$1.75 per ton (averaging about \$1.62 per ton), in gold and silver values.

The Leonard is the principal mine of the Boston & Montana, employing about 600 men. The old 3-compartment 1,129' shaft became badly drawn, and has been replaced by a new 4-compartment shaft, which has the largest capacity of any in the district. This was opened by raising from the 1,200' level of the old workings, and was practically complete at the close of 1905, though not fully equipped. The new shaft is a down-cast, aiding materially in ventilation. The Leonard mine shows a very large vein, and carries exceptionally good gold values. Mine is timbered with 12x12" and 14x14" square sets, and owing to width of vein, solid bulkheading is needed in most stopes, the Leonard requiring an average of about one million feet of mine timbering monthly. The mine has electric signal bells. A new and very complete surface equipment is being given the Leonard, to be finished in the spring or summer of 1906. This will include, when completed, a 140' steel gallows-frame, with self-dumping skips and 150-ton ore-bins. The new Nordberg hoist, weighing 500 tons, with 32x72" cylinders, capable of raising 10-ton skips from a depth of 3,500', will hoist with 1½" round steel cable, discarding the flat wire rope so generally popular in western mining camps. Skips

will displace cages also, because of their superior quickness in operation, which means lower hoisting charges. The new equipment will include a new boiler plant. Machinery equipment at the old Leonard shaft includes a 50-drill Nordberg compound air-compressor with 15", 28" and 42" steam cylinders, and 19", 27", 29", and 42" air cylinders, also a duplex Risdon compressor with 14", 26" and 30" steam cylinders and 14" and 30" air cylinders. The Allis-Chalmers hoist at the old shaft has 19x48" cylinders, operating 2 double-deck cages. There also is a 12x14" Risdon sinking engine. A new and improved precipitating plant was built at the Leonard, replacing two old plants, in 1905.

The Mountain View Mine has an 1,851' three-compartment shaft, with 15 exits and connections. On surface is a 115' steel gallows-frame, and the old 18x48" Allis engine has been replaced by a new hoist good for 3,000'. Plant includes an Allis air-compressor with 20x42" steam cylinders and 22x42" air cylinders, and a 12x14" Risdon sinking engine.

The Pennsylvania mine has an 1,875' three-compartment shaft, which was deepened 314' in 1905. The Pennsylvania is connected underground with the Mountain View, St. Lawrence and Silver Bow No. 1 mines. Surface plant includes a 19x48" Allis hoist, operating two double-deck cages, a 12x14" sinking engine and an Ingersoll-Sergeant air-compressor with 20x30" steam cylinders and 24½x30" air cylinders.

The West Colusa has a 1,634' three-compartment shaft, deepened 198' during 1905, and it is planned to deepen it to 2,000' during 1906. The mine has seven exits and connections, and is timbered with 10x10" and 12x12" square sets. Surface equipment includes a 60' steel gallows-frame, 13x12" Iron Bay sinking engine and 20x60" Nordberg hoist operating 2 single-deck cages.

The East Colusa has a 900' three-compartment shaft, with four exits, and is equipped with a 16x32" Griffith & Wedge hoist.

The Moose mine has a 400' shaft. This is a comparatively new property, but little developed, and was idle in 1905.

Among the miscellaneous properties are the Comanche, slightly developed, and the Badger, which has been leased. The Boston & Montana owns 110 acres of ground on the Meaderville flat, and this has been opened to some extent by two shafts, known as Nos. 4 and 5. This ground, formerly held in poor repute, is much increased in promise by developments of a favorable nature made at other properties in East Butte.

Steam power is used exclusively at the mine. The water from the Mountain View and East and West Colusa mines drains to the 1,200' level of the Leonard, and is forked thence by a duplex station-pump with Nordberg steam-end 20"x40"x42" and 7½x42" plungers. The steam-end is fitted with Corliss valve; and carries a fly-wheel. The water-end was made by the company and cast in the Silver Bow foundry, at Butte. Valves are of the pop form, and the entire water-end is phosphor-bronze, and columns are lined with wood, thoroughly soaked with oil and coated on the inside with hot tar, to withstand the corrosive action of the mine water. Ultimately all of the company's mines will be unwatered from this plant, which is capable of raising 1,000 gallons per minute, against a head of 1,200'. The mine water, which carries considerable cop-

per in solution, is leached on reaching surface, the copper being precipitated on scrap-iron, and product turned into bluestone.

The ore bodies of the various Boston & Montana mines are very extensive, and reserves of smelting grade ore alone are estimated at about 3,000,000 tons. The mine has some stopes of high-grade ore nearly 200' wide, and is opened several years ahead of any possible productive requirements. Nearly 150 power drills are operated in the various mines of the company, and the production is divided into approximately 85% concentrating ore and 15% smelting ore.

The concentrator and smelter are at Great Falls, 171 miles from the mine, with a freight charge of \$1 per ton on ore, over the Great Northern railway, the high freight rate being offset by the advantage of the water-power developed at Great Falls. The concentrator is second only in size to the monstrous Washoe plant of the Anaconda, and is in six sections, each a complete mill in itself, the six having a total capacity of 2,700 tons daily. The building is of wood and is equipped with six 10x20" and twelve 5x12" Blake reciprocating crushers, 15 Huntington mills, 18 rolls, 317 sieves, 68 Hartz jigs, 249 Evans jigs, 5 Overstrom concentrators, 42 Wilfley concentrators 10 six-foot vanners and 54 four-foot vanners. Thirty Evans round slime-tables were displaced by 40 Wilfley tables, in 1905.

The smelter treats 300 to 400 tons of high grade ore, and the mill-product of about 2,700 tons of concentrating ore, daily. The plant has 22 McDougall calciners, five 500-ton water-jacket blast-furnaces, four 175-ton reverberatory furnaces and 12 converters of the upright type, each 84x170" outside dimensions. Product is blister copper of 99% tenor, carrying 40 oz. silver and 0.25 oz. gold per ton. In connection with the smelter there is a very large electrolytic refinery, having a daily capacity of 70 tons of refined copper cathodes, the gold and silver slimes being reduced and parted in a refinery at the plant. The electrolytic plant also has 3 furnaces for melting cathodes for casting the refined copper into wire-bars, cakes and ingots. The electrolytic copper from this plant is very pure, and ranks high in the market. A portion of the blister copper from the smelter is sent to the Raritan copper works, at Perth Amboy, N.J., and the plant also does a very limited amount of custom smelting. Current for the electrolytic plant is carried by solid overlapping slabs of copper. The management is giving consideration to the matter of increasing the present capacity of the Great Falls plant by about 25%, but the plans in that connection are still of a tentative nature.

Power for the concentrator, smelter and electrolytic refinery, is secured from the Black Eagle falls of the Missouri river, these having a 42' effective head, and generating 8,700 h. p., except at the lowest stages of water. The auxiliary steam plant has 2,400 h. p. in Stirling water-tube boilers, and can supply water for the concentrator, blast-furnace blowers, electric motors, and cranes, in periods of low water.

Fuel consumption for 1905 was 37,000 tons of coal at the mines, while at the reduction works were burned 250 cords of wood, 130,518 tons of coal and 51,372 tons of coke.

For seven years the Boston & Montana was materially hampered in its

operations by litigation with the Montana Ore Purchasing Co., United Copper Co., and various corporations subsidiary to the two companies named. This was ended, in February, 1906, by the formation of the Butte Coalition Mining Co., which took over practically all of the Heinze interests in the Butte camp, and the slate has been wiped clear of the disastrous litigation that has done so much harm, in the the past, to all the big mines of the camp.

Production, for the calendar year 1905 was approximately 89,000,000 lbs. fine copper. The management of the mine is all that could be desired.

BOSTON & NEVADA MINING CO.

NEVADA.

Letter returned unclaimed from former mine office, Yerington, Nevada.

BOSTON & NEW MEXICO COPPER CO.

NEW MEXICO.

Office: 502 Colonial Bldg., Boston, Mass. John E. Kimball, president; Andrew Swanson, treasurer; C. J. Arthur, secretary and manager. Organized April, 1903, under laws of South Dakota with capitalization \$200,000. Lands, sundry mining claims in Socorro county, New Mexico. Apparently a stock-jobbing scheme merely.

BOSTON & PIOCHE MINING & DEVELOPMENT CO.

NEVADA.

Office: Boston, Mass. Mine office: Pioche, Lincoln Co., Nev. C. S. Miller, general manager. Land, 10 claims, lying to the eastward of the Nevada-Utah property, including the Fannie and Peavine mines, both small producers, in the past. Development is by shaft.

BOSTON & ST. MARY COPPER MINING CO.

Letter returned unclaimed from former office, Great Falls, Montana.

**BOSTON-ST. PAUL CONSOLIDATED
COPPER MINING CO.**

WASHINGTON.

Office: 712 St. Peter St., St. Paul, Minn. Mine office: Index, Snohomish Co., Wash. Wm. H. Baker, president; O. S. Derringer, secretary. Capitalization \$2,000,000, shares \$1 par. Lands, 8 claims, adjoining the Ethel. Idle, except for annual assessment work.

BOSTON & SEATTLE MINING CO.

MONTANA.

Office: care of C. R. Tuttle, secretary, Cleveland, Ohio. Mine office: Elliston, Powell Co., Montana. A. J. Wheeler, president; Robt. I. McKay, treasurer. Lands, 11 claims, 4 patented, circa 12 miles from Elliston, said to show large bodies of low-grade ore, which might be worked advantageously only with railroad facilities, now lacking. Presumably idle.

BOSTON & SEVEN DEVILS COPPER CO.

IDAHO.

Dead.

BOSTON-SIERRA MADRA MINE INDUSTRY CO.

WYOMING.

Office: 1118-59 Clark St., Chicago, Ills. Mine office: Slater, Routt Co., Colo. Employs 5 men. Amos Pettibone, president; Lewis A. Pease, secretary, treasurer and general manager; D. E. Turner, superintendent. Organized December, 1900, under laws of Wyoming, with capitalization \$1,000,000, share \$1 par. Lands, two claims, area 41.3 acres, in the Three Forks district of Carbon county, Wyoming, carrying 2 fissure veins in andesite, opened by

shafts of 40' and 160', and a 400' tunnel, with 1,200' of underground openings, showing argentiferous galena, cuprite and chalcopyrite. Is 45 miles from a railroad, but expects rail connections shortly.

BOSTON & SILVERTON MINING & REDUCTION CO. COLORADO.

Office: 39 Court St., Boston, Mass. Mine office: Silverton, San Juan Co., Colo. A. A. Lamont, superintendent. Ores carry gold, silver, lead and copper. Has steam power and a 10-stamp mill. Claims too much in its literature offering stock.

BOSTON TERRACE COPPER MINING CO. UTAH

Office: 631-53 State St., Boston, Mass. H. T. Gerrish, treasurer. Capitalization \$500,000, shares \$1 par; issued, \$1,400,000. Lands, 11 claims, area 220 acres, in the Newfoundland district of Box Elder county, Utah, having about one-half mile of underground openings, including 10 shafts of 30' to 285' depth. Ores have assayed up to 27% copper, 19% lead, 86 oz. silver and \$1.20 gold per ton.

BOSTON & TEXAS COPPER CO. TEXAS.

Office: 405 Tremont Bldg., Boston, Mass. Letter returned unclaimed from former mine office, Spalding, Archer Co., Texas. E. M. Low, president; Jas. M. Wheaton, secretary and treasurer. Organized 1898, under laws of Arizona, with capitalization \$2,500,000, shares \$10 par. Idle for some years and apparently moribund.

BOSTON & TEXAS COPPER MINING CO. TEXAS.

Presumably dead. Was promoted, in 1898, by Chas. Denison, Hartford Trust Bldg., Hartford, Conn., who advertised it as another Calumet & Hecla. Cannot be learned that any mining was attempted.

BOSTON & TINTIC MINING CO. UTAH.

Office: 401 D. F. Walker Bldg., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Silver City, Juab Co., Utah. Wm. H. Tibbals, president and general manager; E. J. Waugh, secretary; R. L. Lyman, treasurer. Organized 1899, under laws of Utah, with capitalization \$500,000, shares \$1 par. Lands, 3 patented claims, area 45 acres, in the Tintic district, opened by a 240' shaft, showing 2 fissure veins of 8" average width, 20' length and 200' depth, with estimated average values of 35% copper, 4% to 53% lead, 14 oz. to 120 oz. silver and 40 cents to \$2 gold per ton. Idle for several years.

BOSTON & WYOMING COPPER-GOLD CO. WYOMING.

Office. Custer, S. D. Mine office: Wheatland, Laramie Co., Wyo. W. A. Nelson, president; John I. Hightower, vice-president and general manager; W. E. Benedict, secretary. Organized October, 1903, under laws of South Dakota, with capitalization \$2,000,000, shares \$1 par. Lands, 6 claims, area 120 acres, known as the Seldom Seen group, showing 3 fissure veins in granite-porphry, giving assays of 5% to 7% copper, 6 oz. silver and \$3 gold per ton, from cuprite, chalcocite, bornite, and chalcopyrite, with sulphide ores predominating. Presumably idle.

BOULDER BAY MINE. ALASKA.

Owned by Reynolds-Alaska Development Co.

BOULDER COPPER MINING CO.**SOUTH DAKOTA.**

Office: P. O. Box 118, Custer, S. D. W. A. Nelson, president. Capitalization \$1,000,000, shares \$1 par. Lands, in Pennington county, South Dakota, are said to show gold and copper ores. Idle.

BOULDER MINING CO.**BRITISH COLUMBIA.**

Office: Oshkosh, Wis. Lands, sundry gold-copper claims in British Columbia.

BOULDER MINING & MILLING CO., LTD.**IDAHO.**

Lands, sundry claims in the Alto district of Idaho, showing ores carrying gold, silver, lead and copper. Presumably idle.

ASMUS BOYSEN MINING CO.**WYOMING.**

Office: 266 South Clark St., Chicago, Ills. Mine office: Thermopolis, Fremont Co. Wyo. Asmus Boysen, president; N. C. Brorson, secretary and treasurer. Organized under laws of Wyoming, with capitalization \$25,000,000, shares \$100 par. Property consists of the right to locate 640 acres of land on the Shoshone Indian reservation. This is said, by Boysen, to be worth \$25,000,000, undeveloped, but as Boysen is in controversy with the Secretary of the Interior as to where this land can be located, the value of the property is much closer to 30 cents. Company advertises, on its show window, to have copper, gold, silver, oil and coal lands.

BOZEMAN COPPER CO.**MONTANA.**

Office: Bozeman, Montana. Organized August, 1904, with capitalization \$100,000. Cannot be learned that any work is in progress.

BRADEN COPPER CO.**CHILE.**

Wm. Braden, general manager, E. K. McCann, superintendent. Property is the antigua El Teniente, located in the Cordillera de Graneras, and company is protocolized in Chile. Has constructed a fine wagon-road through the hills, at an estimated cost of \$175,000, and has ordered powerful machinery, including hydraulic and electric plants, both for mining and smelting, from the United States.

BRADFORD COPPER MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Presumably idle.

BRADFORD DEVELOPMENT CO.**ARIZONA.**

Dead.

BRADSHAW MINING CO.**ARIZONA.**

Office: 327 New York Life Bldg., Chicago, Ills. Mine office: Briggs, Yavapai Co., Ariz. Samuel B. Willey, president; Davis Ewing, secretary and treasurer; Frank T. Day, manager; E. W. Fisher, general superintendent; Wm. Roberts, superintendent. Organized 1904, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Property is leased to North American Exploitation Co.

Lands, 23 claims, area 400 acres, also a 40-acre millsite, in the Castle Creek district, showing contact veins of 30' to 100' width, between granite and porphyry, carrying galena, cuprite melaconite and malachite, said to give assays of 15% copper, 20% to 40% lead, and \$6 to \$10 gold per ton, opened by shafts of 150' and 300' and tunnels of 150', 80' and 60' esti-

mated by management to show 6,000 tons of ore, with 4,000 tons blocked out for stoping. Apparently idle, and management not well regarded.

BRADSHAW MOUNTAIN COPPER MINING & SMELTING CO. ARIZONA.

Dead. Lands now held by De Soto Mining Co.

BRAGANZA GOLD MINING CO. ARIZONA.

Mine office: Big Bug, Yavapai Co., Ariz. Property is the Henrietta mine, carrying gold-copper ores. Has steam power and a 10-stamp mill.

NEGOCIACION MINERA DE O. y T. BRANIFF y CA. MEXICO.

Office: Rosales 9, Mexico, D. F. Mine office: Cadereyta, Queretaro, Mex. Ores carry silver, copper, lead and zinc. Has steam power and a 6-ton smelter, employing circa 200 men at last accounts.

BRAULIO MADRIGAL TUMBISCATA. MEXICO.

Mine office: Apatzingan, Michoacán, Mexico. Mines are opened by shaft and tunnel. Has steam power.

GEWERKSCHAFT GRUBE BRICCIUS-STOLLN. GERMANY.

Mine office: Annaberg, Saxony, Germany. E. R. Poller, manager. Has argentiferous copper and zinc ores. Idle at last accounts.

GEWERKSCHAFT BRIGITTA ERZBERGWERK. GERMANY.

Mine office: Sennheim, Elsass, Germany. Has lead, copper, and zinc ores. Idle at last accounts.

BRINDLE PUP MINING CO. ARIZONA.

Letter returned unclaimed from former mine office, Dewey, Ariz.

BRISTOL COPPER MINING CO. NEVADA.

Office: 201 Mining Exchange Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Pioche, Lincoln Co., Nev. Wm. Gelder, president. Capitalization \$2,000,000, shares \$1 par. Lands, 440 acres owned in fee, and a half interest in the 80-acre town site of Bristol. Lands adjoin those of Hillside Copper Mining Co., with which the Bristol is closely allied, in ownership and management. Has made small ore shipments, assaying 12% to 30% copper and about 10 oz. silver per ton. Has 2 hoists and power drills. Idle since 1903.

BRISTOL MINE. CONNECTICUT.

An old and idle mine at Bristol, Hartford county, Connecticut. Was worked during the last decade of the Nineteenth Century. Is filled with water, and mine machinery is at bottom of shaft.

BRITANNIA COPPER MINE, LTD.

Offices: 4, Bishopsgate St., London, E. C., Eng. W. E. LaMerton, secretary. Capitalization £90,000, shares £1 par; issued, £7,000. Whereabouts of lands, if any, not learned. Idle and apparently moribund.

BRITANNIA COPPER SYNDICATE, LTD. BRITISH COLUMBIA.

Office: P. O. Box 821, Vancouver, B. C. Hon. Edgar Dewdney, president; W. C. McMeekin, vice-president; Geo. H. Robinson, managing director; J. W. Lee, secretary. Organized under laws of British Columbia, and capitalization increased, August, 1905, to \$937,500, in \$625,000 preferred stock, shares \$625 par, and \$312,500 ordinary stock, shares \$312.50 par. The ordinary shares will rank for dividends and other respects *pari passu* with existing ordinary

shares, so soon as same shall have been subdivided into new shares of \$312.50 par.

Lands, 7 claims, area 297 acres, lying 4 miles from and about 3,500' above salt water, at Howe Sound, Nanaimo division, British Columbia, with approximately 8,500' of the strike of a mammoth mineral zone. The mineralized belt consists of schistose silicious ores, 300' to 600' wide, impregnated with copper and iron pyrites, with porphyry to the south and black slate on the north. Ore body is of immense size, amount actually exposed probably exceeding 3,000,000 tons, with a certainty of far larger amounts at depth. Climate is favorable, and mine can be worked open-cast for many years. Mine is opened by tunnels and quarries. The Jane tunnel, 360' long, has a 600' trestle, and the Big Bluff tunnel has a 640' trestle, each with 10-ton self-dumping cars. At the mine are Blake crushers, passing ore to a sorting belt, and thence to a 1,000-ton receiving bin, whence ore is given to the buckets of the tram-line.

Ore is taken from the mine to the mill, at tidewater, by a Riblet automatic aerial tram of 16,800', in two section, with an intermediate transfer station. The 11,000' lower section has a drop of 1,800', and the 5,800' upper section has a drop of 1,400'. Capacity is 100 tons per hour.

Power is generated to the extent of 500 h. p. from a creek 1,900' above tidewater, with water-wheels at the beach. Compressor plant at the mine and crushing plant at the mill are driven by electric power. There is a three-mile transmission line, with two 200-kw. 6,600-volt generators.

The 300-ton concentrator is 125'x133' on the ground, equipped with 60 concentrating tables and Hancock jigs, latter recovering about 70% of the product and giving higher grade concentrates than table concentrators. At the bay is a 250' wharf with 90' wing, for shipment of concentrates to the Crofton smelter, which is operated by the Britannia Smelting Co. Ltd., a corporation closely connected with the Britannia Copper Syndicate, Ltd.

At the beginning of 1906, ore production was about 250 tons daily, but it is planned to increase this from time to time to 1,000 tons, which is the present capacity of the plant. The ores of the Britannia carry \$10 to \$30 per ton in copper and gold values, but while averaging low in grade, the ore bodies are of a large size. The Britannia is exchanging ores with the Brown-Alaska, as the latter lacks silicious sulphides, while the Britannia requires the excess iron of the Brown-Alaska ores. The Britannia has been developed very thoroughly and the methods and equipment are to be commended. The property is one of great possibilities, and as it possesses an excellent management, should be heard from prominently in the future.

BRITANNIA MINING CO.

MONTANA.

Office: 219 Germania Bldg., Milwaukee, Wis. Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. G. R. Nickey, president and general manager; G. R. Best, secretary and treasurer. Organized Sept. 25, 1892, under laws of Wisconsin; capitalization increased, Mar. 2, 1898, to \$350,000, shares \$1 par. Has paid dividends of \$42,000. Lands, one patented claim, area 13 acres, showing 6 veins, of which 3 parallel veins, of 3' to 30' width, are developed by shafts of 100', 150' and 400', with circa 1,000' of

underground openings, showing ore claimed to give average values of about \$35 per ton, mainly in silver. Has steam power.

BRITANNIA SMELTING CO., LTD.

BRITISH COLUMBIA.

Office: P. O. Box 821, Vancouver, B. C. Works office: Crofton, Nanaimo district, B. C. Hon. Edgar Dewdney, president; Geo. H. Robinson general manager; H. C. Bellinger, consulting engineer; L. E. Gooding, metallurgist; W. H. Yost, master mechanic. Capitalization \$625,000, shares \$25 par. Is very closely connected with the Britannia Copper Syndicate, Ltd. Lands, 49 acres. The smelter, built 1901-1902, by the Northern Smelting & Refining Co., is located on the eastern coast of Vancouver Island, about 50 miles from Victoria, being connected therewith by rail and water, and is 60 miles by water from the Britannia mine, and well located for treatment of coast and Alaskan ores. Ore arrives in railway cars, on barges, and is received at a 750' wharf, with 21' of clear water alongside, whence cars are hauled up inclined trestles to six 300-ton receiving bins. There also are 8 storage bins of same size, with room for additional bins, all bins having automatic discharge gates.

The sampler, 26x32' and 84' high, has two 10x20" Blake crushers, one pair Davis 12x13" crushing rolls, Constand automatic sampler, Coolidge sampler, one rubber belt, one canvas belt, elevators, etc., with a 45-h. p. engine and generator, and auxiliary heater. The furnace building, 45x75', has a 350-ton 42x160" water-jacket blast-furnace, a 200-ton Garretson pyritic furnace and a 65-ton remelting furnace. The Garretson furnace is designed for both smelting and conversion in one operation, but is not yet perfected, so is used for ordinary smelting. The dust-flue is 10x12x200' with a 24x40' dust-chamber, connected with a circular brick stack 12' in diameter and 120' high, on a concrete base. Slag is granulated and dumped by bucket elevator.

The convertor building, 65x73', has one stand and four 84x126" shells, of trough type, converters being tilted by a hydraulic accumulator. Molten matte runs from settlers to converters in a launder, and converter fumes pass through a steel flue into a dust-chamber, with water sprays for laying the copper dust. An electric traveling crane is to be added. The converter has a silica mill, with pneumatic tamper run by a small air-compressor.

The briquetting plant is housed in a 35x73' building with 78x104' dry-shed. Equipment includes a No. 7 Chambers briquetting machine and 2 Scott elevating brick-cars, with steam coils in the loft of the dry-shed. Briquettes will be roasted with raw ore. The power plant is 50x60', with blower-room 40x50', and boiler-house 40x48', housing three 140-h. p. boilers. The power plant has a 110-kw. Westinghouse current generator, and air-compressors for convertor blast, and Nos. 5 and 8 Connersville blowers, connected with a 54" blast-pipe, leading to the furnace. Blowers have a united capacity of 9,000 cubic feet of free air per minute.

Miscellaneous buildings include a well constructed office, assay office, and a small but complete machine shop. Buildings are electric lighted throughout.

A quantity of Brown-Alaska ore is received in exchange for Britannia ores, this exchange aiding each property in securing a better mixture for smelting. It is expected that the Crofton plant will do considerable custom smelting

in the future. Blister copper is shipped to New York for refining. This plant is one of the best in Canada, and is well managed throughout.

BRITISH AMERICAN GOLD-COPPER CO. SOUTH DAKOTA.

Office: 70 Grand River Ave., Detroit, Mich. Letter returned unclaimed from former mine office, Deadwood, Lawrence Co., S. D.

BRITISH COLUMBIA AGENCY, LTD. BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Alberni, Vancouver Island, B. C. Property includes the Modoc and Kitchener claims, said to give a fair showing of chalcopryite and auriferous quartz.

BRITISH COLUMBIA CHARTERED CO. BRITISH COLUMBIA.

Letter returned unclaimed from former office, Street Railway Chambers Montreal, Quebec. Mine office: Summit, Yale district, B. C. Is commonly known as the B. C. mine. Lands, 8 full and 3 fractional claims, developed by about 7,000' of underground workings, showing argentiferous and slightly auriferous ores averaging about 5.5% copper. Has a 225-h. p. steam plant, with 4-drill Rand and 5-drill Ingersoll-Sergeant air-compressors.

BRITISH COLUMBIA COPPER BRITISH COLUMBIA & WASHINGTON. CO., LTD.

Office: 31 Nassau St., New York. Mine office: Greenwood, Yale district, B. C. Employs 275 to 300 men. F. L. Underwood, president; F. L. Sommer, vice-president; R. H. Eggleston, secretary and treasurer; preceding officers, P. G. Bartlett, C. H. Burke, Edwin Hawley, Colgate Hoyt, Josiah C. Reiff and John Weir, directors; J. E. McAllister, manager; S. Carl Holman, mine superintendent; Frederic Keffer, consulting engineer. Organized, March, 1898, under laws of West Virginia, with capitalization \$2,000,000, shares \$5 par; issued, \$1,825,000. Laidlaw & Co., registrars; Metropolitan Audit Co., auditors. Annual meeting, second Tuesday in February.

Lands, 4 groups, including 26 claims, area 350 acres, and a 60-acre mill-site, in British Columbia, also sundry claims in Washington. Properties are the Motherlode and No. 7 groups, in the Deadwood Camp; the Sunset group in the Similkameen district, near Princeton, B. C.; the Emma mine in Summit camp, and the Apex group near Chesaw, Okanogan county, Washington.

The Motherlode group, on which the principal mining operations are conducted, has an area of 180 acres, showing 5 ore bodies, of which 3 are being developed. Country rocks are limestone, porphyry and eruptive diabases, veins occurring as contacts between limestone and the eruptive rocks. Ore is exclusively auriferous and argentiferous chalcopryite, occurring with silicious and calcareous gangue, or in magnetite. Ore bodies are irregular in occurrence, main vein, ranging 80' to 150' in width, giving average returns of about 1.5% to 1.75% copper, 0.2 oz. to 0.5 oz. silver and \$1 to \$2 gold per ton. Development is by a 325' two-compartment shaft, and 3 tunnels, of 500', 750' and 900' length. Underground openings aggregate between 2 and 3 miles, disclosing an enormous tonnage of ore, amounting to fully 3,000,000 tons, with perhaps 1,000,000 tons blocked out for stoping. Tunnels are connected with surface by 6 upraises, of 200' average height, these reaching quarries on surface, through which ore is milled to the tram-cars in tunnels, giving

cheap mining costs. The shaft is to be enlarged to 4-compartment size, and deepened to 500'. There are 5 hoists, one with 20x42" cylinders, good for 1,500'. Main tunnel has a double track, equipped with 3-ton tram-cars. At the portal of the tunnel is a 24x36" Farrel crusher, of 75 tons hourly capacity. Machinery equipment at the Motherlode mine includes a 500-h. p. steam plant, with 30-drill cross-compound straight-line condensing Corliss air-compressor, 10-drill auxiliary compressor, 25 power drills, Robins belt conveyor and Jeffrey bucket elevator. Electrical power, furnished by the West Kootenay Power Co., is being substituted for steam, at the mine, and the compressors and crushers are to be driven by Canadian Westinghouse induction motors. Buildings include a 30x50' carpenter shop, 30x70' machine shop, 17 other mine buildings and 20 dwellings for employes.

The Emma mine in the Summit camp, is owned $\frac{3}{4}$ by the British Columbia and $\frac{1}{4}$ by the Hall Mining & Smelting Co., but is operated by the former. Mine has a 100-h. p. steam plant and is said to be developing very satisfactory.

The low-grade copper ores of the Sunset group are high in silica, and low in lime and iron.

The No. 7 mine, adjoining the Motherlode, has a 300' main shaft, with about $\frac{1}{2}$ mile of underground openings. Ores carry values in copper, zinc, silver and gold, in a 7' vein, with quartz gangue.

The Apex group, 11 claims, at Chesaw, Okanogan county, Washington, is just over the line of the Boundary district, and is in the development stage.

The smelter, at Greenwood, 5 miles from the Motherlode mines, receives ore therefrom over the Canadian Pacific railway, and also does a general custom business. The blast-furnace building, 45x58', has two 375-ton Allis-Chalmers water-jacket furnaces, 42x150" at the tuyeres, and by fall of 1906 is to have three 600-ton furnaces, each 48x240" at the tuyeres. The smelter has a 12x14x620' dust-flue, leading to a 121' stack. There are 5 electric locomotives, 3 for ore, and 2 for slag, which is handled in 5-ton side-dumping pots.

The converter building, 45x90', of steel, has 2 stands, and five 5-ton shells, 84x126", of trough-type, stands being tilted by hydraulic accumulators, while shells are handled by a 40-ton 4-motor electric traveling crane. First-fusion product is a matte of 45% to 55% copper tenor, which is blown up to 99.5% blister copper, carrying 20 oz. to 50 oz. silver and 10 oz. to 25 oz. gold per ton, which is shipped for refining to the DeLamar works at Chrome, N. J. The converter department has a 72" silica mill for linings.

There is a briquetting plant and a 3-story 65x79' sampling mill.

The power-house, 40x81', has three 100-h. p. boilers and a 150-h. p. Reynolds Corliss engine, but this plant is held in reserve for emergency use, electric power being used throughout the works. The electric power plant secures current, generated 25 miles distant, from the West Kootenay Power Co., and this is utilized by Canadian Westinghouse induction motors. The electric power available for use at the reduction works is 3,000 h. p. There are 2 Connorsville blowers and 3 more large blowers of the same make are to be included in the new smelter equipment. Smelting fuel is coke, costing \$6.50 per ton.

Surplus earnings for 2 years ended Nov. 30, 1904, were \$88,921.80, and net

profit, for fiscal year 1905, was \$102,907.05. Production, for calendar year 1904, was 211,864 tons ore, making 5,081,743 lbs. fine copper, 118,418 oz. silver and 36,403 oz. gold. For calendar year 1905, production was 5,601,309 lbs. fine copper, 95,410 oz. silver and 26,226 oz. gold, showing a considerable falling off in the precious metal values of ore treated. The new smelting plant will give a monthly capacity of about 50,000 tons, as compared with 18,000 tons in 1905, and while the effect will not be fully felt in 1906 production, the 1907 output should reach about 15,000,000 lbs. fine copper. The mine, while low in grade, has an immense tonnage assured, and the management seems all that could be desired.

BRITISH COLUMBIA EXPLORATION, LTD.**BRITISH COLUMBIA.**

Succeeded, circa 1905, by Kamloops Mines, Ltd.

BRITISH COLUMBIA & LAKE SHORE**BRITISH COLUMBIA.****COPPER CO., LTD.**

Letter returned unclaimed from former mine office, Summit, B. C.

BRITISH COPPER SYNDICATE, LTD.

Offices: care of Paines, Blyth & Huxtable, 14, St. Helen's Place, London, E. C., Eng. Organized, Nov. 9, 1905, with capitalization £500, shares £1 par.

BRITISH GOLD & COPPER MINING CO.**SOUTH DAKOTA.**

Said to have property in the Black Hills district, presumably in Pennington county, South Dakota. Address of company not secured, and no work known to be in progress.

BRITISH GOLD MINES OF MEXICO, LTD.**MEXICO.**

Offices: 65, London Wall, London, E. C., Eng. Letter returned unclaimed from former mine office, Torres, Sonora, Mex. Robt. J. Price, chairman; Geo. Thomson, secretary; John F. Allan, managing director in Mexico. Organized Oct. 27, 1896, with capitalization £100,000, shares £1 par; issued, £70,070. Lands include the Colorado Ures mine, area 100 pertenencias, in Sonora, and a portion of El Carmen mine, at Talpupujahua, state of Michoacán. Has a 10-stamp mill and smelter, at the Colorado Ures mine. Idle.

BRITISH ORE CONCENTRATION SYNDICATE, LTD.**WALES.**

Office: 1, St. Helen's Place, London, E. C., Eng. Mine office: Beddgelert, Wales. Chas. N. L. Shaw, secretary. Organized, Dec. 21, 1900, with capitalization £150,000, shares £1 par; issued, £85,007. Property is the British rights to the Elmore oil concentration process, and the Sygun, Cribb Dhu and Aran mines, in North Wales, estimated to show ore reserves of 480,000 tons of gold-copper ores, equipped with a 20-stamp mill and 4-unit Elmore oil concentrator, also an interest in a copper mine in Cornwall. Idle.

BRITISH SOUTH AFRICA COMPANY.**RHODESIA.**

Offices: 2, London Wall Bldgs., London, E. C., Eng. This great corporation owns sundry copper fields of promise in northern Rhodesia, which, as developed to the point of actual mining, are set aside as subsidiary companies.

BRITTON GOLD MINING CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Whatcom, Wash.

K. K. BERG- UND HÜTTENVERWALTUNG BRIXLEGG.**AUSTRIA.**

Mine office: Brixlegg, Tyrol, Austria. Gustav Kroupa, general manager;

Vincens Svoboda, superintendent and mining engineer; Cayetan Hummel, smelter superintendent; Josef Link, purchasing agent. Mining lands, circa 22.5 hectares. Ores are argentiferous and slightly auriferous copper sulphides. Smelter, at Brixlegg, has blast and reverberatory furnaces for smelting, also refining and anode furnaces and a small electrolytic plant. Annual production averages about 5 kgs. gold, 600 kgs. silver, and 225,000 kgs. fine copper.

BROKEN HILL PROPRIETARY CO., LTD.

AUSTRALIA.

Is no longer a copper producer. Described in Vols. IV. and V.

BROMIDE COPPER CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Tres Piedras, N. M.

BROMIDE COPPER & GOLD MINING CO.

NEW MEXICO.

Had 22 claims, circa 1902, in the Bromide district of Rio Arriba county, New Mexico.

BROOKLYN COPPER & GOLD MINING CO.

WASHINGTON.

Office: Auditorium Bldg., Spokane, Wash. M. L. Pershell, president; C. von Gilsa, secretary. Capitalization \$100,000. Lands are in the Colville Reserve, Washington. Declines to furnish any statement. Presumably idle.

BROOKLYN MINING CO.

CALIFORNIA.

Mine office: Dale, San Bernardino Co., Cal. H. H. Ames, superintendent. Ores carry gold and copper. Has gasoline power and a 3-stamp mill.

BROOKLYN MINING CO.

COLORADO.

Mine office: Silverton, San Juan Co., Colo. T. Manion, superintendent. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill.

BROOKLYN MINING CO.

NEVADA.

Mine office: Contact, Elko Co., Nev. Has gasoline power. Idle.

BROOKS CONSOLIDATED COPPER CO.

MEXICO.

Office: Bisbee, Ariz. Clinton W. Moon, president; Robert Brooks, vice-president and general manager; G. O. Schaecker, secretary and treasurer; George Motz, superintendent. Employs 12 men. Organized January 25, 1906, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par, as a reorganization of the Cochise Prospecting, Mining & Development Co. Lands, 3 groups of claims, area 620 acres, in the Ajo Mountains, 40 miles northeast of La Cananea, Arizpe district, Sonora, Mexico. Development is by open-cuts, pits, and short tunnels, showing oxide, carbonate and sulphide ores, latter predominating, ores being estimated to average 8.75% copper, 4% zinc, 12 oz. silver and \$5 gold per ton. Vein is very strong, ranging 50' to 60' in width, and traceable 1½ miles. Property is considered decidedly promising, and management seems vigorous and businesslike.

BROOKSHIRE MINING CO.

ARIZONA.

Mine, near Mayer, Yavapai county, Arizona, is operated by the George A. Treadwell Mining Co., which owns 80% of the stock of the Brookshire Mining Co.

BROWN-ALASKA COPPER CO.

ALASKA.

Mine office: Coppermount, Prince of Wales Island, Alaska. Samuel Silverman, general manager; J. L. Parker, superintendent; Paul Johnson, consulting engineer. Property includes the Mamie group, opened to 500' level, and

adjoining claims. Ore body on the Mamie is about 40' wide, giving average assays of 6% copper and \$1 gold and silver per ton. Ore is chiefly chalcopyrite, associated with pyrrhotite and pyrite, occurring in lenticular bodies connected by thin seams. Mine is quite extensively opened.

The reduction plant includes a 60x80' sampler, 50' high; coke and coal sheds 100x140'; blast-furnace building 60x70', of steel construction, with room for addition of converter plant; 40x50' boiler house; 45x50' engine house and 4 sets of ore bins, 60x120', with capacity of 10,000 tons, plant being so arranged that material can be handled automatically. The furnace is 44x160" at the tuyeres, with daily capacity of 400 tons, equipped with mechanical feed. Slag is handled by 2 locomotives, drawing 5-ton slag-cars. Coke is brought from Ladysmith, B. C., at a cost of about \$6 per ton, delivered. Plant includes a 250-light electrical equipment. Smelter was blown in, December, 1905, and in addition to Mamie ores, does considerable custom smelting. The Brown-Alaska is exchanging ores with the Britannia, at Howe Sound, B. C., as the Brown-Alaska lacks silicious sulphides and the Britannia needs the excess iron that the Alaskan ores furnish. This is considered one of the most promising, as well as among the most advanced, of the Alaskan tide-water copper mines.

BRUCE & CHESOR MINING CO.

BOLIVIA.

Mine office: Oruro, Bolivia. Has steam power and employed about 100 men at last accounts, in producing native copper from conglomerate strata, somewhat similar to those found in the Lake Superior district.

BRUCE COPPER MINES, LTD.

ONTARIO.

Voluntarily liquidated May, 1902. Lands are now held by Copper Mining & Smelting Co. of Ontario, Ltd.

BRUCE MINING CO.

IDAHO.

Mine office: Junction, Lemhi Co., Idaho. A. T. Bruce, general manager. Has copper-gold ores, opened by tunnel.

BRUGER y CA.

BOLIVIA.

Office and mine: Toledo, La Paz, Bolivia. Are small producers of copper. Have steam power.

JOSÉ GONZALEZ BRUNO.

CHILE.

Mine office: Cajon de Maipú, Santiago, Chile. Mines have copper ores, carrying cobalt in connection, and all equipped with steam power, employing circa 50 men, at last accounts.

BRUNSWICK MINING CO.

COLORADO.

Mine office: Tin Cup, Gunnison Co., Colo. Ores carry gold, silver and copper. Has steam power and a 100-ton concentrator. Presumably idle.

BRUSTAD MINES, LTD.

NORWAY.

Offices: 62, Leadenhall, London, E. C., Eng. Mine office: Eidsvold, Norway. G. T. Broadbridge, secretary. Organized February 11, 1905, under laws of Guernsey, as a second reconstruction of Golden Mint Mines, Ltd., with capitalization £3,000,000, shares £1 par. Lands, in Eidsvold district, are 8 miles east of Lake Mjosen, and 50 miles north of Christiania. Property was first worked as a copper mine very early in the Nineteenth Century. Development is by tunnel, showing a vein of 30' width, carrying copper and gold val-

ues. Has a mill with 15 stamps, 3 Frue vanners, Wilfley tables and an Elmore concentrating plant. Mine evidently has made some little production in the past, as evidenced by the large slag-piles.

BUCHANAN MINE.**CALIFORNIA.**

Office and mine: care of G. A. Pherson, owner, Daulton, Madera Co., Cal. Lands, sundry claims, 5 miles northeast of Daulton, near the Green Mountain mine, opened by shafts and tunnels. Vein matter, diabase and amphibolite schist, both mineralized. Ores, oxides near surface, unaltered sulphides at depth. Shipments made by lessees average about 15% copper and \$3 gold per ton. Has been a considerable producer in the past.

BUCKEYE CONSOLIDATED GOLD &**NEW MEXICO.****COPPER MINING CO.**

Dead. Property was near Socorro, Socorro county, New Mexico.

BUCKEYE COPPER CO.**WASHINGTON.**

Office: care of John Coup, 318 American Trust Bldg., Cleveland, Ohio. Mine office: Index, Snohomish Co., Wash. Organized under laws of Washington. Lands, 3 claims, lying 2 miles west of Baring and 5 miles southeast of Index, formerly held by Index-Independent Mining Co. Has about 1,000' of openings, on a vein that stands nearly vertically, traversing granite. Ores are chalcocite, bornite and chalcopyrite, with quartz gangue. Mine has shipped several carloads of ore, giving average returns of about 50% copper.

BUCKEYE MINING CO.**MEXICO.**

Office: Cincinnati, Ohio. Mine office: Ranchita de Aguilar, Sonora, Mex.

BUCKEYE MINING & SMELTING CO.**OREGON.**

Mine office: Grants Pass, Josephine Co., Ore. J. M. James, president; W. P. McCoy, general manager. Organized under laws of Pennsylvania. Property is the Buckeye mine, opened by two tunnels, showing ore assaying up to 20% copper and \$5 to \$20 gold per ton. Company is said to plan building a 100-ton smelter.

BUENA VISTA COPPER MINES, LTD.**MEXICO.**

Offices: 11, Queen Victoria St., London, E. C., Eng. S. Spencer, chairman; E. T. Stanton, secretary; T. A. Cox, mine manager. Organized May 24, 1899, with capitalization £50,000, shares £1 par; issued, £276. Lands, 50 acres, including the Buena Vista and San Bruno copper claims and the Aurora gold claim, near the Boleo mines, Baja California, Mexico.

BUENA VISTA COPPER MINING CO.**ARIZONA.**

Mine office: Solomonville, Graham Co., Ariz. Has a 100' shaft, showing ore, and sent a sample shipment of 25% ore to the El Paso smelter, 1903.

BUENA VISTA COPPER MINING CO.**CALIFORNIA.**

Mine office: Valley Springs, Amador Co., Cal. Property includes the Bull Run and Russell mines, carrying sulphide copper ores in schistose diabase. Has steam power. Presumably idle.

BUENA VISTA MINING & MILLING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Washington, Ariz.

BUENOS AIRES MINING CO.**MEXICO.**

Dead. A swindle, conceived in the fertile brain of Dr. R. C. Flower, now

a fugitive from justice. "Assets" were inherited by the Pan-American Mining & Smelting Co.

BUFA MINING, MILLING & SMELTING CO.

MEXICO.

Mine office: 709 Lankershim Bldg., Los Angeles, Cal. Mine office: La Bufa, Sahuaripa, Sonora, Mex. Employs about 600 men in the dry season, and 300 in the wet season. Davis Richardson, president; Wm. E. Richardson, vice-president and general manager; Baron W. Riley, secretary; Lewis R. Richardson, treasurer; Frank Richardson, superintendent; Arthur A. Lane, mill superintendent; Patrick Quinn, mine superintendent; Edwin M. Clark, engineer and metallurgist. Organized 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Has paid 5 dividends, last being \$60,000, July, 1905. Lands, 50 pertenencias, area 123 acres, also a 10-acre millsite, and 5,000 acres miscellaneous lands, showing 6 fissure veins, of which 2 are undergoing development, these averaging 4' width and opened to 600' on an incline, giving average assays of 10% copper, 10% lead, 4% zinc, 150 oz. silver and \$2.50 gold per ton, from argentiferous tetrahedrite and sulphide copper ores. Has shafts of 300' and 600', and a 225' tunnel, with 8,000' of underground openings and about 20,000 tons of high-grade ore blocked out for stoping, with a considerable amount of low-grade ore on the dump, for eventual treatment.

Machinery equipment includes a 120-h. p. plant at the mine, with 2 hoists, 2 Rand air-compressors and 7 power drills. The mine buildings include several small shops, a store, sawmill and about 20 dwellings.

The concentrator has 35 tons daily capacity, with a small sampling mill attached. There also is a 20-ton leaching plant, now idle.

The smelter, at the mine, receives ore by gravity tram. Equipment includes reverberatory furnaces of 10 and 25 tons capacity, built of silica brick, made on the ground, only the iron-work being brought in. Fuel is inferior wood, cut on the premises. Product is a matte carrying 50% copper, 600 oz. to 800 oz. silver and 1.5 oz. gold per ton, which is shipped to Aguascalientes, via Guaymas, for refining. Some rich ore is shipped also. Transportation is by burros, but rail connection is expected from the extension of the Cananea, Rio Yaqui y Pacifico line. Production, for 1904, was about 1,200,000 lbs. fine copper. Operations were considerably hampered, during 1905, by the depredations of the Yaqui Indians, and the prospects for the immediate future are not peaceful.

BUFFALO & ARIZONA MINING CO.

ARIZONA.

Mine office: Hot Springs, Yavapai Co., Ariz. H. G. Bennett, superintendent. Ores give assays of \$21 per ton, in copper and gold.

COMPANIA DEL FERROCARIL Y MINAS DEL BUITRON.

SPAIN.

Mine office: Zalamea la Real, Huelva, Spain. Don Diego Bull, general manager. Company is controlled by F. C. Hills & Co., of London. Mines include the Castillo del Buitron and La Poderosa, area 6 hectareas, at Zalamea la Real, and the Concepción mine, area 42 hectareas, at Almonáster. Sundry other properties are under exploration. Annual production is estimated at about 1,500,000 lbs. fine copper.

BULLARD BROS.**ARIZONA.**

Office: Martinez, Ariz. Lands, 5 claims, in Cunningham Pass, Harcuvar Mountains, Yuma county, Arizona, said to show considerable ore assaying 7% to 10% copper and \$10 in gold and silver per ton.

BULL DOMINGO MINING CO.**WYOMING.**

Mine office: Hecla, Laramie Co., Wyo. John L. Morgan, superintendent, at last accounts. Ores carry copper and gold values. Presumably idle.

BULLION BECK & CHAMPION MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. P. L. Farnsworth, manager. Secures a limited amount of copper, as a by-product, from auriferous and argentiferous lead and copper ores. Has steam and electric power and a concentrator, employing circa 125 men.

BULLION CITY BORNITE COPPER**COLORADO.****MINING & MILLING CO.**

Office: Ebensburg, Pa. Mine office: Aspen, Pitkin Co., Colo. T. V. Hott, president; A. W. Van Houten, secretary and general manager. Employs 6 men. Lands, 11 claims, 7 patented, area 110 acres, 8 miles distant from railroad, with good wagon-road between. Has shafts of 50' and 90', showing a 2' vein of bornite, assaying 25% copper, 53 oz. silver and 1 oz. gold per ton.

BULLION MINING CO., LTD.**IDAHO.**

Office: Wallace, Idaho. B. F. O'Neil, president; James H. Taylor, secretary; D. A. McKenzie, general manager. Organized 1902, under laws of Idaho, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, area 80 acres, showing a 12' fissure vein, opened by a 100' shaft and tunnels of 80' and 170', giving assays of 14% copper, 12 oz. silver and \$4 gold per ton, from sulphide ore. Presumably idle.

BULLION MOUNTAINS COPPER CO.**CALIFORNIA.**

Office: 52 Broadway, New York. Mine office: Lavic, San Bernardino Co., Cal. Organized under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Was promoted by H. R. Leighton & Co., since bankrupt. Company claims to have mines and reduction works at Lavic, hence presumably succeeded to property of the Peacock Copper Co., which had a 50-ton concentrator, but ran out of ore. Regarded with suspicion.

BULLWHACKER COPPER CO.**MONTANA.**

Office: care of Patrick Clark, president, Spokane, Wash. Mine office: Butte, Silver Bow Co., Mont. Organized March, 1906, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 2 claims, known as the Bullwhacker and Butte & Boston Placer. A 2' vein of 10% ore was cut April, 1906, at a depth of 18' from surface.

BULLWHACKER GOLD & COPPER CO.**ARIZONA.**

Presumably dead.

BULLY HILL COPPER MINING & SMELTING CO.**CALIFORNIA.**

Office: 42 Broadway, New York. Mine office: Winthrop, Shasta Co., Cal. Employs 350 men. D. M. Riordan, president; John B. Keating, general superintendent; H. R. Hanley, assistant general superintendent. Organized 1900, under laws of New Jersey, with capitalization \$2,500,000, shares

\$25 par. Control of property was changed, 1905, and supposedly is in hands of the General Electric Co., which is variously reported to have paid one to one and a half million dollars for the Bully Hill mine.

Lands, 23 claims, including 18 patented claims, area 213 acres, in the Pittsburg district, circa 25 miles northeast of the Mountain copper mine at Keswick, and supposedly in the same geological horizon. Lands include the Winthrop mine, which is being extensively developed. The Tamarack group, at Shasta City, is supposed to be held under a \$10,000 bond.

The Bully Hill was opened as a gold mine, and worked the gossan with rather indifferent results, until copper ores were developed at depth. Bully Hill, with a diameter of about 4,000', rising 1,200' above the surrounding country is composed of eruptive rocks, principally basalt and rhyolite, with 3 mineral zones, having a strike of approximately north and south, the ore occurring in shear-zones in rhyolite and meta-diorite dykes, all of superficially stony structure, the lenses having a clay gouge of 1' to 30' on one or both walls. The main lenses have stringers and feeders, ranging from a few inches to 30' in width, carrying 2% to 30% copper. The principal lenses are 20' to 300' long, 2' to 40' wide, averaging about 30', and opened to a depth of 672'. The zone of secondary enrichment shows about 10' of bonanza ore, the main ore bodies below carrying chalcopyrite associated with pyrite, also a little bornite and chalcocite, with occasional carbonate and oxide ores and native copper. The best ore body gives average assays of about 15% copper, 6 oz. silver, and \$8 gold per ton, and shows native copper and native silver in considerable quantities on the 670' level. Mine is opened by shafts of 600' and 300', and by crosscut tunnels of 600', 800', 1,000' and 1,200', giving a back of about 350'. No. 2, the main working tunnel, 1,000' long, has double tracks, and a 100x100' underground station, containing powerful pumping and hoisting machinery. The mine is timbered with square sets. Early in 1906 a large body of high-grade ore was being developed on the lower level of the mine.

The mine and mill have steam and electric power, with 300 h. p. at the mine and 350 h. p. at the smelter. Equipment at the mine includes four 100-h. p. hoists, good for 1,000' depth each, and 3 Rand air-compressors, of 14 drills aggregate capacity. Buildings, about 20 in number, include an iron-sheathed 40x50' machine shop.

The smelter, one mile from the mine, receives ore therefrom by the Bully Hill railroad, a 4-mile private line owned by the company. The smelter building, 39x310' in size, has a 90' stack, and is terraced throughout, permitting handling of all material by gravity. The reduction plant has roast-stalls in series, with 2 McDougall circular calcining furnaces, and two 42x120" blast-furnaces, rated at 150 tons daily capacity each. The first product is a 35% to 50% matte, taken in ladles by an electric traveling crane to the converter department, which has two stands, with 68x96" shells, of barrel type, turning out 99% blister copper, which is shipped to the DeLamar works, at Chrome, New Jersey, for electrolytic refining. The smelter has a small but complete machine shop in connection. Limestone

and iron ore for fluxing are obtained from quarries on the McLeod river, 6 miles distant, but there is a scarcity of suitable ferruginous ores for fluxing the high-grade sulphides produced by the mine.

The mine is said to have been highly profitable to the former owners, but itemized figures are lacking. Annual production probably averages about 5,000,000 lbs. fine copper, and doubtless will be materially increased by the present highly efficient management.

BUNKER HILL MINING & SMELTING CO.

WASHINGTON.

Office: 5011-1 Madison Ave., New York. Mine office: Index, Snohomish Co., Wash. Charles G. Reiter, president; John D. Campbell, secretary; Wilbur Morris, treasurer; V. V. Clark, general manager; Charles A. McClair, superintendent. Organized October 24, 1902, under laws of Maine, with capitalization \$3,000,000, shares \$1 par. Lands, 18 claims, area circa 300 acres, also a 5-acre millsite, showing sundry fissures in granite, and contact veins between granite and diorite. Has shafts of 86' and 600', with 400' of underground openings, showing two ore bodies, one a vein of 2' to 50' width, carrying chalcopryite averaging about 1% copper, 0.5 oz. silver and 40 cents gold per ton. Has compressed air and electric power, generated by a water-wheel, with two power hoists, a duplex 10-drill Ingersoll-Sergeant air-compressor and various mine buildings. Concentrator has one Blake crusher, one Austin crusher, 3 sets of rolls, 3 Wilfley tables, slime tables, 2 buddles and a magnetic separator. Shipped 5 car-loads of concentrates in 1905, and began regular shipments January 1, 1906. Plans increasing milling capacity to 100 tons daily and installing a reverberatory furnace, with converter, for making blister copper. Employs 20 men. Property seems conservatively handled and is regarded as promising.

BUNKER HILL-SULLIVAN COPPER MINING CO.

WASHINGTON.

Reorganized, 1902, as Bunker Hill Mining & Smelting Co.

BUNKERVILLE MINING CO.

NEVADA.

Mine office: Bunkerville, Lincoln Co., Nev. Presumably idle.

BURLINGTON COPPER MINING CO.

WYOMING.

Supposed to have property in the Encampment district of Carbon county, Wyoming, but location of lands not learned. Presumably idle.

BURMA COPPER MINES, LTD.

Offices: 716, Salisbury House, London, E. C., Eng. W. T. Wariner, secretary. Organized Nov. 5, 1903, with capitalization £100. shares £1 par. No lands—no business—no excuse for organization.

BURNS MINING CO.

WASHINGTON.

Mine office: Darrington, Snohomish Co., Wash. Thos. Parks, superintendent, at last accounts. Lands include the Myrtle and Justice claims, opened by tunnel. Presumably idle.

BURNS-MOORE MINING & TUNNEL CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. John M. Shaller, superintendent. Ores carry gold, silver, lead and copper. Has water power.

BURRA BURRA COPPER MINING CO.

AUSTRALIA.

Office: Eagle Chambers, Adelaide, South Australia. Mine office: Burra

Burra, Burra Co., South Australia. T. B. Gall, chairman; V. Lawrence, secretary and treasurer; Wm. West, general manager; Jas. S. Pryor, superintendent. Organized 1901, under No Liability Act of South Australia, with capitalization £120,000, shares £1 par, 10s. paid in; issued, £95,173. Lands, 672 acres freehold, with mineral rights to 11,065 acres of adjoining lands. Country rock is argillaceous slate. Mine is opened by 5 tunnels, of 600', 300', 330', 420' and 180'. Ores in upper levels were cuprite, malachite, azurite and native copper, occurring in very rich but irregular bunches, lower levels showing bornite and chalcopyrite. Property was opened 1845 and closed 1877, after making 51,662 long tons fine copper, valued at £4,749,224, and paying dividends of £826,585. Was reopened, 1901, by present company. Ore is shipped to Port Adelaide, 107 miles, by rail, for smelting. Fuel used is wood, costing 12s. per cord, and soft coal at 30s. per ton. Average grade of ore now mined is about 2%, and production, 1903, was about 100 long tons fine copper. Workings below water level were filled with water, at last accounts. Has steam and electric power and employed about 30 men, at last accounts.

BURRAGA COPPER CO.**AUSTRALIA.**

Mine office: Burraga, County Bathurst, New South Wales. Property is about one mile east of the "Lloyd" mine, and was opened in 1877. Production was 570 long tons refined copper in 1898. Ores are sulphide, occurring in a belt of highly altered rocks, ranging from porphyry to schistose slates, and carry 1 oz. to 3 oz. silver per ton. Mine is about 800' deep. Smelter has 3 reverberatory furnaces, using wood for fuel, and product is sent as 47% matte to Lithgow, for refining. Work was suspended latter half of 1904, but production was resumed early in 1905.

BURRO MOUNTAIN COPPER CO.**NEW MEXICO,**

Office: 402-108 Equitable Bldg., Chicago, Ills. Mine office: Silver City, Grant Co., N. M. Nathan F. Leopold, president; Sidney Lang, superintendent. Organized 1904, with capitalization \$50,000. Lands, circa 600 acres, in the Burro Mountain district, including the St. Louis mine, held under bond and lease from the Southwestern Copper & Iron Co. The St. Louis is said to have produced more than \$1,000,000 worth of ore, and was opened by a 500' shaft with upwards of one-half mile of openings, when taken by present company, and is said to show large bodies of 7% to 8% ore.

Concentrator was remodeled and doubled in size, to capacity of 150 tons, early in 1906. Machinery plant includes dynamo for power and 300-light generator for lighting. Property also has a 10-ton smelter, which is idle. About 100 men are employed and the mines are being developed systematically. Management is excellent.

BURTON CONSOLIDATED COPPER CO.**WYOMING.**

Letter returned unclaimed from former office and mine, Encampment, Wyo.

BUSTER MINES SYNDICATE, LTD.**ARIZONA.**

Offices: Broad Street House, London, E. C., Eng. J. A. Edmond, chairman; J. R. Shearer, secretary. Capitalization £15,000; shares £1 par; debentures, £1,600, at 10%. Property claimed is a three-fifths interest in a

copper mine, said to be located in the Peck mining district of Arizona. Idle and apparently moribund.

BUTCHER BOY GROUP.**WASHINGTON.**

Mine office: Loomis, Okanogan Co., Wash. Said to be under bond to a Greenwood, B. C., syndicate. Lands, sundry claims in the Myers Creek district, showing auriferous copper ores of fair grade.

BUTLER-LIBERAL CONSOLIDATED MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. J. Corum, president; C. N. Strevell, vice-president; S. M. Orem, secretary and treasurer; W. C. Orem, general manager; D. R. Williams, superintendent. Organized 1903, with capitalization \$500,000, shares \$1 par, as a consolidation of the Ben Butler and Bingham mining companies. Lands, sundry claims in the Bingham district, opened by tunnels, showing 2' of shipping ore in the bottom of a winze from the old Butler tunnel. Has shipped ores to the United States smelter that gave average returns of circa 6% copper, 12 oz. silver and \$1 gold per ton. Is expending about \$2,500 monthly in development work, and employs circa 20 men. Declared a dividend of one-half cent per share, amounting to \$2,500, October, 1903.

BUTLER MINING & MILLING CO.**UTAH.**

Absorbed, 1904 by Butler-Liberal Consolidated Mining Co.

BUTTE & ANACONDA COPPER CO.**MONTANA.**

Succeeded, 1902, by Carlisle Copper Co., since deceased.

BUTTE-ARGENTA COPPER CO.**MONTANA.**

Office: Butte, Mont. Organized, 1906, with capitalization \$3,000,000, by J. E. Oppenheimer, Henry Mueller, A. T. Morgan, J. H. King and John N. Kirk, to take over and operate sundry claims in the Argenta district.

BUTTE & ARIZONA COPPER MINING CO.**ARIZONA.**

Office: Prescott, Ariz. Mine office: Mayer, Yavapai Co., Ariz. Ernest A. Haggott, president and general manager; John C. Job, secretary; W. A. Hazeltine, treasurer; preceding officers, Chas. H. Richards, B. O. Kendall and Emil Baxter, directors. Lands, 9 claims, showing 2 parallel veins, said to average 90' width and to be traceable 3,000' on company's lands, which lie immediately east of the Arizona Blue Bell Copper Co.

BUTTE & BACORN MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. F. W. Bacorn, manager. Organized February, 1906, under laws of Maine, with capitalization \$5,000,000. Property is options on 13 claims in the northeastern part of Butte, about one half mile north of the Pittsburg & Montana and immediately north of the Butte & London. Claims were located in 1905, ground in that vicinity being considered valueless until recently, but in view of developments of past year, property is by no means without promise.

BUTTE & BINGHAM COPPER CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Idle.

BUTTE & BINGHAM COPPER MINING & DEVELOPMENT CO.

Letter returned unclaimed from former office, 35 Congress St., Boston.

BUTTE & BOSTON CONSOLIDATED MINING CO.**MONTANA.**

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Employs about 400 men. Jas. Phillips, Jr., president; Wm. G. Rockefeller, secretary and treasurer; John D. Ryan, general manager; Wm. E. Kane, mine foreman. Organized 1896, under laws of New York, with capitalization \$2,000,000, shares \$10 par. Debentures, \$1,500,000 first mortgage 6% bonds, due April, 1917. Annual meeting, first Monday in April. Is controlled, through ownership of practically entire stock issue, by the Amalgamated Copper Co.

Lands, sundry mines and undeveloped claims in Butte, including the three Silver Bow mines, Michael Davitt, Blue Jay, Berkeley, East Grey Rock and West Grey Rock, also several thousand acres of placer lands.

Silver Bow No. 1 mine has a 3-compartment main shaft of 1,000'. Mine is timbered with 8x8' square sets, and ore is trammed by horses. Mine is connected underground with the Pennsylvania, Berkeley and Silver Bow No. 3. Has an 800-gallon Riedler pump on the 1,000' level. This shaft has a 16x42" hoist, operating two single-deck cages.

Silver Bow No. 2 is idle.

Silver Bow No. 3 has a 4-compartment shaft, 700' deep, and is timbered with 10x10" square sets. A 500-gallon Knowles pump is located on the 600' level. Hoist is a 12x14" Risdon, operating two single-deck cages.

The East Grey Rock mine has a 3-compartment 1,600' shaft. A 20x48" hoist operates two double-deck cages. The surface equipment includes a 23-drill Nordberg air-compressor.

The Berkeley has a 3-compartment 900' shaft, with 18x32" hoist operating two single-deck cages. This is one of the best of the company's mines, but operations were greatly hampered, for several years, by litigation with the Heinze companies. The ending of this tiresome and costly fight, in February, 1906, permits the renewal of development work and production.

The Blue Jay mine has a 1,075' shaft, sunk at an angle of 72°. This has two-compartments to the 600' level, and three below. Hoist is 16x32", operating two single-deck cage-skips.

The Kane shaft was about 200' deep, at the close of 1905.

The Butte & Boston ores are leaner in copper and richer in silver than the average of the Butte camp, the blister copper carrying about 100 oz. silver per ton.

The concentrator and smelter, at Meaderville, were closed down late in 1905, and will be demolished, ores being sent to the Washoe plant, at Anaconda for reduction.

Production, at close of 1905, was about 500 to 600 tons of ore daily, carrying an estimated average of 61 lbs. copper per ton. Output of fine copper for 1905 was about 12,000,000 lbs. For 1906 there should be an increase, due to the removal of the pressure caused by the litigation with the Heinze interests.

BUTTE CENTRAL COPPER MINING & SMELTING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Samuel A. Hall, general manager. Organized March, 1906, under laws of Montana, with capitaliza-

tion \$2,500,000, shares \$5 par. Lands include the old Ophir mine, originally worked for silver, bought March, 1906.

BUTTE COALITION MINING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Thos. F. Cole, president; John D. Ryan, vice-president; preceding officers, Urban H. Broughton, Jas. Hoatson, Chester Congdon, B. B. Thayer, F. L. Ames, Wm. D. Dixon and A. C. Carson, directors; Jas. O'Grady, treasurer. Organized February 24, 1906, under laws of New Jersey, with capitalization \$15,000,000, shares \$15 par.

The Butte Coalition Mining Company was formed, by the joint efforts of Thos. F. Cole and John D. Ryan, to put an end to the desperate and disastrous fight that had raged in the Butte camp, for seven years, between the Amalgamated and Heinze interests. This effort was entirely successful, the Butte Coalition taking over all of the Heinze holdings, except the La France Copper Co., these properties including the Montana Ore Purchasing Co., Nipper Consolidated Copper Co., Guardian Copper Co., Minnie Healy Mining Co., Hypocka Mining Co., Belmont Mining Co., Johnstown Mining Co., and Corra-Rock Island Mining Co. The Alice mine also has been taken over from its former owners. The Butte Coalition Mining Co. is said to have begun business with \$4,000,000 cash, and owns the entire stock issue of the Red Metal Mining Co., which is the direct intermediary for operating the Montana mines. As the result of the reorganization of this company, 80 lawsuits, with aggregate claims for nearly \$100,000,000 damages, were dismissed in the state courts, and 23 lawsuits were dismissed in the United States courts, thus cleaning up the protracted and costly litigation between the Amalgamated and United Copper interests.

Properties turned over by the Montana Ore Purchasing Co. were the Rarus and Johnstown mines, one-third interest in the Tramway mine, one-half interest in the Snohomish mine, two-thirds interest in the Mountain Chief mine, one-half interest in the Highland Chief mine, two-fifths interest in the Vulture mine, also the Ellen, Applegate and sundry other mineral claims, and ore and mineral rights under 108 lots in the city of Butte. The Rarus mine employs about 300 men, when fully worked. Vein is upwards of 300' wide in places, and the property is very valuable. The Snohomish and Tramway mines are valuable, but development has been very much hampered by past litigation.

The Johnstown Mining Co. turned over fractional interests in the Rarus, Johnstown and Pennsylvania mines, and an eighth interest in the Minnie Healy mine.

The Minnie Healy Mining Co. turned over a part interest in the Minnie Healy mine, also the Lake claim. The Minnie Healy mine, adjoining the Leonard and Colusa mines of the Boston & Montana, is opened by a 1,000' two-compartment shaft, and is connected underground with the Leonard, Rarus and Tramway mines, employing about 200 men.

The Corra-Rock Island Mining Co. turned over the Corra and Rock Island mines, also part interests in the Snoozer, Blackfoot, Robert Emmett and other claims. The Corra-Rock Island has a 1,200' main shaft, showing

best values below 1,000', where the ore is unusually rich in silver. About 250 men are employed.

The Nipper Consolidated Copper Co. turned over the Nipper mine, and interests in sundry other claims. The Nipper has two shafts, of about 1,000' each, timbered with 10x10" square sets, with 12 exits, and is connected underground with the Parrot, Neversweat and Little Minah mines. The Nipper employs about 250 men.

The Hypocka Mining Co. and the Guardian Copper Mining Co. each turned over fractional interests in the Minnie Healy mine.

The Belmont Mining Co. turned over sundry fractional interests in claims aggregating 67½ acres area, lying in the southeastern part of Butte, opened by a 1,000' shaft, upper levels of which showed good argentiferous ore. The ground grew poor at a depth of 350', but is good again at 1,000'.

In addition to the Heinze interests, the Butte Coalition has bought the Alice mine, lands 17 claims, area 340 acres. This is one of the oldest properties in the Butte camp, and was a highly profitable silver producer, for many years, but is known to contain large bodies of copper ore at depth. The 1,050' shaft is being unwatered, and the ground also is being opened by drifts from the 1,900' level on the Valdamere claim of the Corra-Rock Island.

Smelting operations have been transferred from the La France smelter, at Basin, to the Washoe works at Anaconda. In March, 1906, the Butte Coalition was shipping 350 tons of ore daily, and produced circa 2,750,000 pounds fine copper that month, giving an average return of circa 70 pounds per ton. In April, 1906, the production was about 3,000,000 pounds fine copper. Operations were hampered in the past, at these mines, by litigation with the Amalgamated interests, but, in view of the peace that has been secured, it will be possible to greatly increase the production of the Butte Coalition mines, and there seems no good reason why the output should not be nearly doubled within 12 to 18 months. The Butte Coalition presumably has been earning at the rate of \$2 per share from the start, and, with doubled production, should earn \$4 to \$5 per share yearly.

The Butte Coalition is blessed with an unusually experienced and aggressive management, and the properties held are of great value.

**BUTTE COMMERCIAL COPPER MINING &
DEVELOPMENT CO.**

MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. J. R. Wharton, president; E. Siegel, vice-president; J. H. Maloney, secretary G. A. Brophy, treasurer. Organized April 10, 1906, under laws of Montana, with capitalization \$5,000,000, shares \$5 par. Lands, sundry undeveloped claims in the northeastern part of the Butte district.

BUTTE CONSOLIDATED MINING CO.

MONTANA.

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. J. Brown Goode, manager; E. H. Renisch, superintendent. Lands 1,050 acres, known as the Lake Red placers, including the Ella mine, having a 700' two-compartment shaft, showing auriferous and argentiferous copper ore.

BUTTE COPPER BELT MINING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. James Talbot, president; Samuel H. Treloar, vice-president; J. R. Siebers treasurer; Russell P. Howard, secretary; A. J. Poser, manager. Organized April, 1906, under laws of Montana, with capitalization \$7,500,000. Lands, circa 200 acres, undeveloped, on the continental divide, just east of Butte.

BUTTE COPPER CO.**MONTANA.**

A moribund corporation, once holding bonds on the Jessie and other Butte claims.

BUTTE COPPER EXPLORATION CO.**MONTANA.**

Office: care of N. Bruce McKelvey, secretary and treasurer, 87 Milk St., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. E. A. Nichols, president; Alfred F. Leopold, vice-president and general manager; preceding officers, Spencer R. Hill, Thomas S. Dee, Frank E. James and Warren Nichols, directors; Geo. T. McGee, superintendent. Employs 30 men. Organized January, 1906, under laws of Montana, with capitalization \$500,000, shares \$5 par. Lands, 8 claims, area circa 80 acres, lying near to and northeast of the Pittsburg & Montana, also an option on the Six O'Clock group of 7 claims, near the Butte & London, and the Golden Chief claim, which has a 130' shaft, showing a 30' vein of low-grade ore at the bottom. The Grand Prize claim is slightly opened by tunnel. The Six O'Clock group has a two-compartment 440' shaft, sunk by Samuel Newhouse, which at a depth of 40' cut through a 30' vein of low grade ore. This shaft has been unwatered, and it is planned to deepen same to 1,500', and crosscut both north and south at depth of 1,200 feet, or thereabouts, to intercept the copper veins presumably existing, and drift thereon, which is a sound plan of development. Management is good, and property is regarded favorably.

BUTTE COPPER MINING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. John MacGinnis, manager. Organized March, 1906, with capitalization \$1,500,000, shares \$1.50 par. Lands, sundry claims, including the Robert Emmet No. 1, Robert Emmet No. 2, Anselmo No. 1, Anselmo No. 2, and Trifle, all lying along the Gagnon and Stewart veins. The Emmet was opened to a depth of 300', showing 7% ore in the bottom, when former operators were driven out by water and lack of cash. The Anselmo mines were considerable producers of silver in the early days of Butte. Management is good and property is regarded as promising.

BUTTE COPPER MINING & SMELTING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Patrick Mullins, general manager; Samuel A. Hall, secretary; Patrick Wall, superintendent. Property was the Dutton mine, a fractional claim, under lease, in East Butte, which is one of the oldest properties in the camp. Has a 350' shaft, bottomed in a 6' vein of rich ore. Apparently the Butte Copper Mining & Smelting Co. has transferred its lease on the Dutton to the East Butte Mining Co.

BUTTE COPPER & ZINC CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Clarence B. Wisner, president;

A. L. Bailey, secretary. Organized 1905, under laws of New York, with capitalization \$2,500,000. Property is the Emma mine, held subject to a \$55,000 mortgage, owned by Charles E. Dickerman. Company is an offshoot of the Montana Zinc Co. The Emma mine, previously held by the Butte Mining & Development Co., has an 800' shaft, said to show a vein of 300' width at bottom, this carrying about 2% copper and a fair percentage of zinc. Company is said to plan construction of a mill, to use a new process of zinc reduction.

BUTTE & ELY COPPER CO.**NEVADA.**

Office: care of Chas. L. Scott, secretary, Butte, Mont. Mine office: Ely White Pine Co., Colo. Organized 1905, under laws of Montana, with capitalization \$500,000, shares \$1 par. Lands, 12 claims, lying between the Nevada Consolidated and Giroux Consolidated. Property is considered well located, and is regarded as promising.

BUTTE GOLD, SILVER & COPPER CO.**WASHINGTON.**

Office: Spokane, Wash. Lands lie about 25 miles from head of Lake Chelan, Washington, showing 2 veins, one 8' wide, opened by tunnels. Idle.

BUTTE GREEN COPPER CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. Samuel A. Hall, general manager. Organized March, 1906, with capitalization \$500,000, shares \$1 par. Lands include the Green claim, near the Belmont mine of the Butte Coalition. Employed about 20 men, and was claimed to be producing 15 to 20 tons of good copper ore daily, in March, 1906.

BUTTE HILL COPPER MINING CO.**MONTANA.**

Mine office. Butte, Silver Bow Co., Mont. James Higgins, president; Dr. Maurice Eisenberg, vice-president. Organized April 18, 1906, under laws of Montana, with capitalization \$5,000,000, shares \$5 par. Lands, 11 claims, area 173 acres, lying west of the Butte & Bacorn. In April, 1906, had a 125' shaft, bottomed in a 40' vein, showing a 4' paystreak of ore carrying 30 oz. silver per ton. It is planned to sink 1,000', and crosscut from that depth.

BUTTE & IOWA MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Montana. John Hewett, superintendent, at last accounts. Idle and presumably moribund.

BUTTE LODGE EXTENSION MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Montana. Organized April, 1906, with capitalization \$500,000.

BUTTE & LONDON COPPER CO.**MONTANA.**

Title changed, circa April, 1906, to Butte & London Copper Development Co.

BUTTE & LONDON COPPER DEVELOPMENT CO.**MONTANA.**

Office and mine: 46 East Broadway, Butte, Silver Bow Co., Montana. Theodore Brantley, president; James H. Lynch, vice-president; W. E. Reynolds, secretary; Alex Johnston, treasurer; preceding officers: Jas. A. Talbot, E. J. Anderson, Chas. F. Booth, Chas. J. Kelly, W. W. McDowell, G. W. Stapleton, B. F. White and Herman B. Eisenberg, directors; Jack Hanley, superintendent. Organized 1905, under laws of Arizona, with capitalization \$5,000,000, shares \$5 par; issued, \$2,000,000. Title changed, April, 1906,

from Butte & London Copper Co. Lands, 113 acres, known as the Greendale placer claims, lying immediately north of the Pittsburg & Montana, and east of the North Butte, supposedly carrying the eastern extension of the Jessie and other claims of the North Butte. Has begun a 3-compartment shaft, in the centre of the property, planned to be sunk 1,200', thence crosscutting north and south, to intercept extensions of all important veins traversing the tract. Has a temporary hoist, good for 1,000', and has ordered a new plant, with four 125-h. p. boilers, Corliss double-conical drum hoist, and 5-drill air-compressor. Property is regarded as decidedly promising.

BUTTE & MICHIGAN MINING CO.

MONTANA.

Mine office: care of Dr. Wm. Bishop, Butte, Silver Bow Co., Montana. Organized January, 1906, with capitalization \$1,000,000, shares \$1 par, to work sundry undeveloped claims in Leslie Gulch, 6 miles southeast of Butte.

BUTTE-MILWAUKEE COPPER CO.

MONTANA.

Mine office: care of John F. Cowan, manager, Owsley Blk., Butte, Silver Bow Co., Montana. Organized 1906, under laws of Montana, with capitalization \$3,000,000, shares \$2 par. Lands, sundry copper claims in the Argenta district of Beaverhead county, Montana, and 5 claims in Butte, lying 1,200' north of the North Butte, and adjoining the Boston claim of the Alice mine of the Butte Coalition Mining Co.

BUTTE MINE & EXPLORATION CO.

MONTANA.

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Montana. Property was the Pacific mine, in East Butte. Company moribund.

BUTTE MINING & DEVELOPMENT CO.

MONTANA.

Dead. Went broke on the Emma mine, in Butte, Montana.

BUTTE MONTANA MINING CO.

MONTANA.

Office: care of C. D. Jordan, St. Louis, Mo. Mine office: Butte, Silver Bow Co., Montana. Organized circa 1906. Lands include the Alexander Scott mine, adjoining the West Colusa, opened by a 700' shaft, and the Little Annie mine, lying near the Goldsmith, northwest of Walkerville, opened by a 200' shaft.

BUTTE MOUNTAIN TUNNEL MINING CO.

MONTANA.

Office: care of C. W. Pomeroy, vice-president, 63-263 La Salle St., Chicago, Ills. Mine office: Butte, Silver Bow Co., Montana. Wm. S. Switzer, president, secretary and treasurer. Capitalization, \$3,750,000, shares \$1 par. Lands, 7 claims, area circa 102 acres, opened by tunnels of 300' and 1,300', showing chalcopryite, averaging about 2% copper and 2 oz. silver per ton, with small gold values. Idle for several years.

BUTTE NORTHERN COPPER CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Montana. Morgan Strong, president. G. E. Desnell, vice-president and treasurer; J. B. Carne, secretary. Organized April, 1906, with capitalization \$1,500,000, shares \$1.50 par. Lands, 3 claims, held under bond and lease, lying between the Butte & London and Butte & Bacorn.

BUTTE REDUCTION WORKS.**MONTANA.**

Owned and operated by Colusa-Parrot Mining & Smelting Co.

BUTTE & ST. LOUIS MINING CO.**MONTANA.**

Office and mine: 114 East Broadway, Butte, Silver Bow Co., Montana. C. D. Jordan, president; F. H. Ray, vice-president and treasurer; Samuel M. Roberts, secretary and general manager; T. R. Davey, superintendent. Organized February 14, 1906, under laws of Montana, with capitalization \$600,000, shares \$1 par. Lands, one patented claim, known as the Kessler, area circa 18 acres, lying north of the Amy and Silversmith and northwest of the Alice mine, in the Walkerville district of Butte, opened by a 100' shaft, showing gold and silver ores, with copper expected at depth.

BUTTE & SPOKANE MINING CO.**MONTANA.**

Office: care of Patrick Clark, Spokane, Wash. Organized 1905, to take over sundry claims in Butte, Silver Bow county, Montana. Apparently has some connection with the Bullwhacker Copper Co., and may have been replaced by latter.

BUTTE & SUMMIT VALLEY COPPER MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Montana. Thos. W. Buzzo, president; C. D. Joslin, vice-president; James A. Talbot, treasurer; J. W. Thomas, secretary. Organized April 9, 1906, under laws of Montana, with capitalization \$3,000,000, shares \$5 par. Lands, 5 claims, area 67 acres, lying near the claims of the General Development Co., opened by a shaft of 125', on the Saratoga claim.

BUTTE & VERONICA MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Montana. Lands, 2 claims, area 12 acres, opened by shafts of 30' and 70'.

BUTTERNUT GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Humboldt, Yavapai Co., Arizona. Moribund.

BUTTERWORTH MINE.**UTAH.**

Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Claims were slightly developed by tunnel.

BUTTON GOLD MINING CO.**ARIZONA.**

Mine office: Minnehaha, Yavapai Co., Ariz. Ores carry gold, silver and copper. Has steam power and a 5-stamp mill. Presumably idle.

MINA EL CABALLO.**MEXICO.**

Mine office: Indé, Durango, Mexico. Wm. Benton, owner; J. M. De La Torre, superintendent. Has copper-silver ores and steam power. Employed about 40 men at last accounts.

MINA CABALLONA.**MEXICO.**

A prospect, in the Arizpe district of Sonora, Mexico, about 15 miles south of Douglas, Arizona. Shipped some copper ore, carrying gold and silver values, to smelter at El Paso, in 1903. Presumably idle.

CABAÑAS CONSOLIDATED COPPER CO.

Office: care of A. H. Rose, vice-president, 186 First Ave., San Francisco, California.

CABEZAS DEL PASTO MINES.**SPAIN.**

Office: 9, Manriques, Córdoba, Spain. Mine office: Puebla de Guzmán, Huelva, Spain. Owned by C. & J. Sundheim, who have operated the property since 1887. Wm. Guthrie Bowie, general manager; Don Jorge Riecken, superintendent. Lands, 6 concessions, area 104 hectares, with about 300 hectares of adjoining lands, having 12' shafts, deepest 104 metres, with 5,000 to 6,000 metres of underground openings. Ore developed for immediate mining is estimated at 750,000 tons of pyritic ore, and 1,500,000 tons of cupriferous schists. Lenses apparently increase in size, at depth. Mine is opened by overhand stoping, and dry-walling is used in depleted stopes. Ores carry 1.5% to 5% copper, 40% to 52% sulphur and 40% to 44% iron, and the schists range 0.25% to 30% copper. All pyritic ore above 1.5% copper, and all schists above 10% copper, are exported. The lower grade ores are weathered at the mine, to produce cement copper, and the leached ore, free of copper, is sent to France, for the sulphur contained. The water from the mines, where 80,000 to 100,000 cubic metres are in constant storage, carries up to 9 kilograms of copper in solution to each cubic metre, most of which is saved by cementation. The cement copper is washed and classified, the best quality averaging 98.5% copper, which is the best grade of cement copper produced anywhere. Mining by overhand stoping and rock filling is said to prove safer and cheaper than open-cast operations. Surface plant includes Robey hoisting and pumping engines, and the mine has a tramline of 76 cm. gauge, also an aerial tram to the wharves at La Laja, on the river Guadiana. Property is producing on a considerable scale.

CABRALES COPPER SYNDICATE, LTD.**SPAIN.**

Offices: 18, Walbrook, London, E. C., Eng. R. W. Outram, secretary. Organized June 29, 1901, with capitalization £12,000, shares £1 par; issued, £1,207. Inactive and apparently moribund.

EPIGMENIO CABRERA.**MEXICO.**

Office and mine: Guachinango, Jalisco, Mex. Lands, 30 pertenencias, area 74 acres, showing large ore bodies, carrying values in copper, silver and gold. There are some old workings, also limited development of a recent date.

CABRERA MINING CO.**MEXICO.**

Letter returned unclaimed from former office, Velardeña, Dgo., Mex.

MINAS y FUNDICION DE CACOMA.**MEXICO.**

Mexican title of the Cacoma Mining & Smelting Co.

CACOMA MINING & SMELTING CO.**MEXICO.**

Office: 820 Security Bldg., St. Louis, Mo. Mine office: Autlán, Jalisco, Mex. D. P. Richardson, president and treasurer; John Dee, vice-president and general manager; John Nesserly, secretary; John Mann, mine superintendent; M. E. Raines, smelter superintendent. Organized under laws of Arizona, and protocolized in Mexico, with capitalization \$1,000,000, shares \$10 par.

Lands are various properties in vicinity of Autlán, showing mainly fissure veins, in diorite, these ranging 5' to 60' width, ores assaying \$5 to \$20 gold per ton. Lands average 65 miles distance from Ameca, terminal of the

Mexican Central railroad, and are connected therewith by state wagon road. Railroad is expected to reach Autlán within 2 years, by which time company hopes to be on a regular producing basis.

The Volcancillos mine, area 28 pertenencias, 12 miles west of Autlán, is the principal property. This shows a vein of 6 meters average width, carrying chalcopryite assaying 3% to 22% copper and \$4 to \$12 gold per ton. Mine is opened to depth of circa 300', with about 1,000' of tunnels and shafts, estimated to show 60,000 tons of ore. The streaks of massive chalcopryite are selected and matted, copper therefrom being sold to the native metal-workers.

The Purisima, area 24 pertenencias, 12 miles west of Autlán, has a 6' vein of auriferous chalcopryite, opened by 400' of tunnels, and is said to have produced \$60,000 gold from oxidized surface ores.

The El Paso mine, area 40 pertenencias, 12 miles west of Autlán, shows an 8' vein carrying copper, lead, silver and gold, values being principally in silver-lead, opened by a 100' shaft.

La Veta Grande mine, area 60 pertenencias, 30 miles west of Autlán, on the Autlán river, near the proposed railway line, is said to have a 200' vein showing bornite at surface and lower grade iron-copper pyrites at depth, all with gold values. Several thousand horse power is available from the river, at this point.

The Palestina mine, area 8 pertenencias, 12 miles west of Autlán, has a vein of 6 metres width, opened by a tunnel showing auriferous copper ore. Free gold has been taken in considerable quantities from the surface.

The Olvidado mine, area 4 pertenencias, 12 miles west of Autlán, has an 8' vein of auriferous copper ore, slightly developed by tunnel.

The St. Louis group, area 2 pertenencias, 12 miles west of Autlán, is a quarry of fluxing ore, carrying about enough silver to pay for mining.

El Cajon mine, area 8 pertenencias, 12 miles west of Autlán, has a 25' vein of argentiferous and cupriferous hematite, developed by shafts, which is valuable for fluxing ore.

Miscellaneous properties are La Junta, 6 pertenencias; San Carlos, 15 pertenencias; San Juan, 15 pertenencias; San José, 40 pertenencias; Anaconda, 11 pertenencias; El Tigre, 75 pertenencias, and Ouelitlán, 30 pertenencias. More or less work has been done on all of these last-named properties, which are antiguas, formerly worked above the sulphide zone. Efforts of the company are being centered on development, the limited production secured being won mainly to afford employment for the native metal-workers of the Autlán district. Company plans building concentrators at three different points. Present plant consists of a small mill and smelter, equipped with crusher, rolls, jigs and 10-ton furnace. Management seems good, and property is considered of much more than ordinary promise.

CACTUS GROUP.

UTAH.

Owned by Newhouse Mines & Smelters.

CACTUS SMELTING & COPPER CO.

UTAH.

Absorbed by Royal Copper Mining Co., now Newhouse Mines & Smelters.

CADENA DE COBRE MINING CO.**MEXICO.**

Office: care of John W. Gillingham, secretary, Bisbee, Ariz. Organized December 24, 1904. Lands, circa 250 pertenencias, in the Sahuaripa district of Sonora, Mexico, developed by 3 tunnels, said to show good ore. Company paid for lands, but former officers seems to have vested titles in their own names. Ernest E. Hughes, former president, was deposed early in 1906, and present management is suing former officers, to cancel the issue of 550,000 shares of stock, which said officers voted themselves as a gratuity. According to statement of new management, the old officers simply stole the 550,000 shares. The case seems a parallel to that of the South Bisbee. Property presumably valuable.

SOCIEDAD ANONIMA MINAS DE CALA.**SPAIN.**

Offices: Bilbao, Vizcaya, Spain. Mine office: Cala, Santa Olalla, Huelva, Spain. Conde de Rodas, president; Don Emilio Vallejo, secretary. Organized August 31, 1900, under laws of Spain, with capitalization 15,000,000 pesetas. Property is a group of 8 mines, area 346 hectares, at Cala, carrying magnetic iron ore and cupriferous pyrites, ore bodies apparently being extensive. Company is supposed to have built a 97-kilometre railroad, from the mines to San Juan del Aznalfarache, on the Guadalquivir river, in the adjoining province of Sevilla.

CALABASAS COPPER CO., LTD.**ARIZONA.**

A Douglas-Lacey swindle, in Pima county, Arizona. See description of Amalgamated Gold & Copper Co.

CALAVERAS MINING ASSOCIATION.**NEW MEXICO.**

Mine office: Alamagordo, Otero Co., N. M. E. A. Hersperder, superintendent, at last accounts. Lands include the Black Burro mine, showing sulphide ores of copper and lead. Presumably idle.

CALCANTE MINES.**ITALY.**

An idle property near Traves, Torino, Italy, in the western Alps of Piedmont. Formerly was a considerable producer of nickel, cobalt and copper, latter from chalcopryite, found in stratified archaic rocks.

CALEDONIA COPPER CO., LTD.**NEW CALEDONIA.**

Offices: 79½, Gracechurch St., London, E. C., Eng. Mine office: Noumea, Diahot district, New Caledonia. Geo. Allan, president; James W. Chenhall, consulting engineer; A. J. Lindsay-Simpson, secretary. Lands, circa 4,000 acres, including the Ao and Pilou mines. Direct title is held by Les Mines de Cuivre Pilou, Ltd., entire stock issued of which is owned by Caledonia Copper Co., Ltd. Capitalization £750,000, shares £5 par. Debentures, £100,000 authorized, £46,000 issued, at 7.5%. The Pilou mine has been extensively developed, and is connected by tunnel with the Ao, 2.5 miles distant. Main shaft, 240 metres. Ores are carbonates and oxides, near surface, succeeded at slight depth by argentiferous chalcopryite and galena. Ore is dressed to tenor of 13% to 15% copper, the concentrated ore carrying 200 to 400 grams of silver per ton from the sulphide ores, and 2 to 4 grams gold per ton from the oxidized surface ores. Plant includes a 200-ton concentrator. Company was promoted by the notorious London & Globe Fi-

nance Corporation, Ltd., and apparently was robbed before born. Property has been seized by mortgage-holders.

CALEDONIAN EXPLORATION CO.

MEXICO.

Mine office: San Nicolas del Oro, Guerrero, Mex. T. B. C. Murphy, superintendent. Property is the Nantzintla mine, carrying ores of gold, silver and copper, opened by tunnel.

CALEDONIAN MINING CORPORATION, LTD.

NEW CALEDONIA.

Voluntarily liquidated, December, 1903.

COMPANIA MINA DE CALIFORNIA.

MEXICO.

Letter returned unclaimed from former mine office, Cumuripa, Sonora, Mexico. Organized 1901, with capitalization \$1,000,000. Lands, 20 pertenencias.

CALIFORNIA-AMECA MINING CO.

MEXICO.

Mine office: Ameca, Jalisco, Mexico. G. W. Whitney, manager. Was developing the San Pedro copper mine, at last accounts.

CALIFORNIA & ARIZONA COPPER MINING CO.

ARIZONA.

Apparently succeeded by California & Arizona Development Co.

CALIFORNIA & ARIZONA DEVELOPMENT CO.

ARIZONA.

Office: care of Pritchard & Hagen, Bisbee, Ariz. Apparently is successor of the California & Arizona Copper Mining Co. Lands, presumably 7 claims, in the Huachuca Mountains, Cochise county, Arizona, which were under option for a time to the Mitchell Development Co., and later reverted to original owners.

CALIFORNIA, ARIZONA & HECLA MINE.

ARIZONA.

Mine office: Welton, Yuma Co., Arizona. Lands, sundry claims, opened by tunnels of 100' and 160'. Was developing with a small force, at close of 1905.

CALIFORNIA COPPER CO.

CALIFORNIA.

Office: 31 Nassau St., New York. Letter returned unclaimed from former mine office, Daulton, Madera Co., Cal. Property is the Ne Plus Ultra and adjoining claims. Has a 100-ton smelter, but ores proved refractory, and unsuited to economical extraction. Moribund.

CALIFORNIA COPPER KING CO.

CALIFORNIA.

Letter returned unclaimed from former office, 218 South Broadway, Los Angeles, Cal. Lands were 21 claims, in two groups, on Pahlen and McCoy mountains, Riverside county, California, opened by shafts, showing various ore bodies, of 4' to 40' width.

CALIFORNIA GOLD & COPPER CO.

CALIFORNIA.

Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, president and general manager. Has auriferous and argenteriferous copper ores, with water and electric power.

CALIFORNIA GOLD & COPPER CO.

CALIFORNIA.

Office: care of H. C. Hibbard, secretary, Riverside, Cal. A. H. Cram, president and general manager; C. W. Page, vice-president. Organized 1904. Lands, sundry claims in eastern San Bernardino county, known formerly as the Von Trigger mine, said to show 7 parallel veins carrying slightly

auriferous copper ores, which are carbonates to a depth of 80', and sulphides below. Two veins have been slightly opened, these giving average assays of 10% copper. Has a 15-h. p. Fairbanks & Morse gasoline hoist, with about 1,000' of underground openings.

CALIFORNIA IMPROVEMENT CO.

CALIFORNIA.

Office: 101 Sansome St., San Francisco, Cal. Mine office: Mills College, Alameda Co., Cal. F. M. Smith, president and general manager. Property is the Leona Heights mine, in the outskirts of Oakland, producing cuprififerous iron pyrites, carrying 1% to 2% copper and averaging about 45% sulphur. Production, 1905, was 4,303 tons of cuprififerous pyrites, valued at \$18,958.57, shipped crude to acid-makers.

CALIFORNIA MINING CO.

UTAH.

Mine office: Park City, Summit Co., Utah. S. Levy, superintendent. Ores carry gold, silver, lead, copper and zinc. Has steam power and a 50-ton concentrator.

CALIFORNIAN COPPER SYNDICATE, LTD.

CALIFORNIA.

Absorbed, 1902, by Fresno Copper Co., Ltd.

MINA DA CALINHA.

PORTUGAL.

Office: care of M. Paul Chapuy, manager, Santa Appolonia, Lisbon, Portugal. Supposedly owned by a French company. Exports limited quantities of cuprififerous iron pyrites to England.

CALSTOCK TIN & COPPER CO., LTD.

ENGLAND.

Offices: 16, Place Vendome, Paris, France and 30, Moorgate St., London, E. C., Eng. Mine office: Calstock, Cornwall, England. G. Robinson, chairman; C. Fred Thomas, mine manager; John A. Russell, secretary. Organized May 5, 1900, with capitalization £60,000, shares £1 par: issued, £57,707. Debentures, £16,070, at 5%. Property is the Prince of Wales tin mine, and sundry mineral licenses on adjoining property. Has a 56-stamp mill. Presumably idle.

CALUMET & ALGOMA DEVELOPMENT CO.

ONTARIO.

Succeeded, 1903, by Hermina Mining Co., Ltd.

CALUMET & ALGOMA MINING CO.

ONTARIO.

Office: care of Lucas Hermann, Calumet, Mich. Joseph Hermann, chairman. Organized, circa 1905, presumably under laws of Ontario, with capitalization \$1,000,000, shares \$1 par, as successor to the Copper Queen Mining Co., Ltd. Lands, 1,166 acres, in Morin township, Algoma, Ontario, 25 miles north of Bruce Station, showing a 45' fissure vein, traceable circa 3 miles, carrying medium grade chalcoppyrite, more or less auriferous, with occasional bornite and malachite, and giving assays of 5% to 25% copper. Has two shafts, No. 1, nearly vertical, being 138' deep. There also are 2 tunnels, longest 125'. Lands are heavily timbered and well watered. Company was badly pressed for funds, at last accounts.

CALUMET & ARIZONA MINING CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Works office: Douglas, Cochise Co., Ariz. Employs about 1,000 men, of whom 625 are at the mine and 375 at the smelter. About 6% only of the force is Mex-

ican labor. Chas. Briggs, president; James Hoatson, vice-president; Thos. Hoatson, 2d vice-president; Louis W. Powell, 3d vice-president and general manager; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thos. F. Cole, Chester A. Congdon, Chas. d'Autremont, Jr., and Geo. E. Tener, directors; James Wood, smelter superintendent; Henry B. Paull, auditor; J. N. Kinsey, smelter clerk; W. E. McKee, master mechanic; F. E. Whiteley, engineer; John Collins, mine foreman. Organized March, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$10 par; issued, \$2,000,000. Annual meeting, second Monday in April. Merchants & Miners Bank, Calumet, Mich., registrar. Is listed on the Boston Stock Exchange. Has circa 2,100 shareholders. Paid dividends of \$1,700,000 in 1905; has paid total dividends of \$3,400,000, to close of 1905. Ended 1905 with liabilities of \$187,497.33, and with quick assets of \$2,625,758.29.

Lands, 12 claims, area 178 acres, patented, adjoining the Copper Queen Consolidated, at Bisbee, also a 640-acre smelter-site, at Douglas. The shafts are in limestone, showing occasional porphyritic intrusions, and are not far distant from a porphyry contact. Side-line agreements exist with the Copper Queen, insuring freedom from possible litigation, and a preservation of the present neighborly relations. The surface gives small indications of values, showing but small and infrequent outcrops, the existence of the magnificent ore bodies since opened having been inferred correctly from the underground developments in the adjoining shafts of the Copper Queen, and from careful study of the general geological conditions of the district. Ore occurs in highly irregular bodies, the mine showing native copper, cuprite, melaconite, malachite, azurite, chalcocite and chalcopyrite, usually with a talcose gangue, and with considerable hematite and manganese ores, the latter carrying malachite in small disseminated nodules, and frequently averaging 10% to 18% in copper. The ore, which is practically self-fluxing, averages about 2 oz. silver and 0.05 oz. gold per ton, as smelted. The ore bodies are extensively developed, but are not largely blocked out, owing to the constant shifting of the ground, caused by the creeping of the mountain above, as is the case at the neighboring Copper Queen mine, requiring very heavy timbering and constant care for all openings, which renders it prudent to keep costs down by blocking out ore but a comparatively short time ahead of actual stoping requirements.

The original mine is on a single claim of 20 acres, the Irish Mag, on which a finely timbered 4-compartment vertical shaft of 1,298' depth is sunk, in hard limestone throughout, except where cutting the various ore bodies, rendering it safe from drawing. The mine is opened by drifts and crosscuts on the 750', 850', 950', 1,050', 1,150', and 1,250' levels. The upper levels show exceedingly rich ores, there being whole stopes assaying 40%, and even 50% copper. A good ore body has been opened on the Pride claim, by a drift from the 1,250' level of the Irish Mag shaft. An auxiliary double hoist is installed on the 1,000' level of the Irish Mag shaft. When the new machinery at the Oliver shaft is in full running order, the Mag shaft will suspend opera-

tions for a few weeks, for lining up. The shaft has not been idle a day, for nearly 5 years, and has given magnificent service.

The Oliver shaft is 1,150' deep, and is bottomed on the same level as the Irish Mag, the collar of the Oliver being 150' lower than the Mag, and 50' higher than the collar of the Lowell shaft of the Copper Queen. The Oliver shaft develops both of the Senator claims, and shows magnificent ore bodies. This shaft first cut ore at 710', or about 300' higher than in the Lowell. The lower workings show rich sulphides, and in order to save the high-grade ores in the upper levels, for fluxing and enrichment of the average furnace charges, development is being pushed more rapidly in the sulphide zone than above, yet practically all of the oxidized ores now smelted come from development work alone. It is planned eventually to sink both shafts to a depth of 2,000', or even more, should the ore bodies hold out. The shafts have 4 compartments and make very little water, but the mine may become wet at a depth of 1,500' or more. The ground is exceedingly soft, owing to the amount of talc gangue in the ore bodies, and requires heavy timbering. Timber is secured from a great distance, and, to guard against emergencies, large stocks are carried.

Rich ore has been found on the Buckeye claim, by crosscuts from the Oliver shaft of the Calumet & Arizona, and from the Cole shaft of the Lake Superior & Pittsburg. The ore body is of large size as well as of good grade.

The southernmost claim is the Gibraltar, wedged between the lands of the Pittsburg & Duluth and Lake Superior & Pittsburg properties, the Gibraltar claim also having shallow exploring shafts and open-cuts showing iron and a little low-grade copper ore, of promising appearance. The company also owns two detached tracts, one being the Wagner and Hope claims, about 2,000' southwest of the Irish Mag shaft, and adjoining the Pittsburg & Duluth mine. These have been opened by a crosscut from the Mag shaft, traversing 600' of Copper Queen ground, and stopping about half way across the Hope and Wagner. This has shown nothing of importance.

Developments in the Junction and Calumet & Pittsburg mines give a prospective value to the Washington, Angel and Old Republic claims, lying on the porphyry side of the gulch, which were considered of little promise when bought, and which were secured mainly as a possible smelter site.

The main surface plant is clustered about the Irish Mag shaft, on a steep hillside, graded for the purpose. The shaft has a 78' steel gallows-frame and a 114' ore bin, with a 20x60' direct-acting Nordberg hoist, capable of raising a 3-deck cage at the rate of 2,000' per minute, from a depth of 1,600'. This hoist has raised about 600 tons of ore daily, from an average depth of nearly 1,000', beside caring for men, timber and tools—a record never before made by one shaft in Arizona. The compressor plant includes a new 35-drill air-compressor and 3 class WB2 Sullivan straight-line compressors. Much of the ore is so soft that it can be bored with a breast-auger, thus reducing requirements in the way of air for power drills.

The plant includes carpenter and machine shops, smithy, timber mill for framing mine-sets, office building, warehouse, etc. Four 40-h. p. Buffalo ver-

tical engines, direct-connected to 25-kw. 115-volt Crocker-Wheeler generators, furnish electric light, and power for the ventilating fans. An automatic telephone system has 25 stations underground and on surface, and is connected with the smelter at Douglas. There is a substantial hospital for mine employes, and a model changing-house, with hot and cold running water, tub and shower baths and lockers for 500 men. There are hose-houses and hose-carts at each shaft, and each shaft has a direct pipe-line to big storage tanks, giving a pressure of 100 lbs., all hose-fittings being made to connect with those of the Bisbee fire department.

The Oliver shaft will have its permanent equipment completed in the spring or summer of 1906. The power plant will include four 280-h. p. marine boilers, burning crude petroleum, and a 35-drill Sullivan Corliss cross-compound two-stage air compressor, with 17x34" steam cylinder and 20x34" air cylinder, with a piston displacement of 6,600 cubic feet of free air per minute.

The smelter, at Douglas, 25 miles from the mine, receives ore over the El Paso & Southwestern railway, under a very favorable freight rate. The first stack was blown in Nov. 15, 1902. Equipment includes four 300-ton water-jacket blast-furnaces, with foundation laid for the fifth, and material for the furnace on the ground. One furnace runs on ores of the Lake Superior & Pittsburg and Pittsburg & Duluth mines. An addition to the smelting capacity was made, 1905-1906, under phenomenal difficulties, no less than five different carloads of material being so badly wrecked that it was sent back to the manufacturers for rebuilding, by no less than five different railroad smashups. Matte is discharged into tilting wells, and taken thence by electric traveling cranes, 3 in number, to the converters, of which there are 4 stands, which turn out 99.2% blister copper carrying small gold and silver values. The converter building was widened 15' in 1905, and 2 cranes added.

The power plant at the smelter was enlarged in 1905, and a new boiler-house built, this housing five 250-h. p. boilers and two 280-h. p. boilers. There is a 400-h. p. engine running two Nordberg air-compressors with cross-compound steam ends, having 22x42" cylinders, with 48" stroke, the air cylinders being 48x48", maintaining a 12-lb. blast pressure. Petroleum is used for fuel, there being four 45,000-gallon oil tanks for storage. Water in ample supply is secured from flowing artesian wells, of 450' average depth. During 1905 a new steel dust-chamber was added, and a new steel smoke-stack, 200' high and 16' in diameter, was built. At the smelter are two 16-room lodging houses and a number of dwellings. Blister copper is shipped for refining to the Nichols Chemical Works, New York.

Production, 1905, was 31,772,896 lbs. fine copper, a small gain over 1904, secured from 202,952 tons smelted, giving an average return of 7.82%, as against 7.70% in 1904. Average price received for copper sold, 1905, was 14.93 cents per pound. Net earnings for 1905 were \$2,315,000, or \$11.50 per share, giving an average cost, per pound of copper, of 7.03 cents, all construction costs, which were considerable, being charged direct to operating expenses.

The Oliver shaft was supplying about one-third of the total ore production of the mine, early in 1906. With both shafts in full commission, the mine should show an increased output for 1906, and a further considerable gain in 1907.

Under the same general management as the Calumet & Arizona, are the Lake Superior & Pittsburg, Pittsburg & Duluth, Calumet & Pittsburg and Junction Mining companies. The four last-named companies, the first two of which became producers in 1905, will be consolidated in 1906, as the Superior & Pittsburg Mining Co. The Calumet & Arizona is one of the best among the world's big copper mines, and it has a management of which a similar high opinion can be expressed with truth:

CALUMET & BISBEE DEVELOPMENT CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Frank S. Carlton, president; Wm. R. Oates, secretary; Geo. O. Beehler, manager. Organized Oct. 20, 1902, under laws of Arizona, with capitalization \$400,000, shares \$10 par; 15,000 shares issued and fully paid. Lands, 4 claims, at Don Luis, adjoining the Lake Superior & Pittsburg. Has a 960' main shaft. Idle, owing to lack of funds. Fully described in Vol. IV.

CALUMET & BUTTE DEVELOPMENT CO.

MONTANA.

Office: care of Herman Bibber, Calumet, Mich. Mine office: Butte, Silver Bow Co., Mont. A. M. McKenzie, manager. Organized 1906, under laws of Arizona, with capitalization \$200,000, shares \$10 par. Lands, 2 claims, known as the Albert and Richelieu, near the Altoona group, slightly developed by 2 shafts, showing malachite, azurite and native copper.

CALUMET & COCHISE DEVELOPMENT CO.

ARIZONA.

Liquidated, 1905, with all debts paid and a dividend of 47½ cents returned to shareholders. Fully described in Vol. IV.

CALUMET COPPER CO.

COLORADO.

Office: 131 La Salle St., Chicago, Ills. Mine office: Turret, Chaffee Co., Colo. Hon. Wm. E. Mason, president; David W. Medbury, secretary; Elmer E. Briggs, general manager; G. W. Mendenhall, superintendent. Lands, 3 claims, known as the Copper King group, on Middle Mountain, showing schistose veins in a formation of micaceous granite, with porphyry intrusions, carrying auriferous and argentiferous copper oxides and sulphides. Development is by incline shafts of 40' and 85'. Presumably idle.

CALUMET COPPER MINING CO.

WASHINGTON.

Dead. Property sold, under foreclosure, to Mt. St. Helens Cons. Mg. Co.

CALUMET & DULUTH DEVELOPMENT CO.

ARIZONA.

Dead. Options on lands near Bisbee were forfeited.

CALUMET & HECLA MINING CO.

MICHIGAN.

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Mill office: Lake Linden, Houghton Co., Mich. Smelter offices: Hubbell, Houghton Co., Mich., and 1 Austin St., Buffalo, N. Y.

Alexander Agassiz, president; Col. T. L. Livermore, vice-president; Quincy A. Shaw Jr., second vice-president; Rudolph L. Agassiz, third vice-president; preceding officers, Francis L. Higginson, Francis W. Hunnewell

and Jas. N. Wright, directors; Geo. A. Flagg, secretary and treasurer; James MacNaughton, general manager; Will A. Childs, superintendent; W. M. Gibson, assistant superintendent; J. H. Lathrop, chief clerk; Fred S. Eaton, cashier; E. S. Grierson, chief engineer; E. D. Leavitt, consulting mechanical engineer; Joseph R. Risque, chief mining captain; W. H. Cake, mill superintendent; Jas. B. Cooper, smelter superintendent at Lake Linden; Morris B. Patch, smelter superintendent at Buffalo; Hon. Chas. Smith, chief mill and smelter clerk at Lake Linden works; Geo. M. Kendall, chief smelter clerk at Buffalo works.

Organized 1871, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; \$12 paid in, and \$928 50 per share in dividends paid out to end of 1905. Charter renewed, 1900, for 30 years, and amended, 1905, under new laws of Michigan, making the corporation a securities holding company as well as a mining and smelting company. Is a consolidation of the Hecla, Calumet, Portland and Scott mining companies. Fiscal year ends April 30. Annual meeting is in August. Stock is listed on the Boston Stock Exchange, and traded in on the unlisted department of the New York Stock Exchange. Has paid dividends, to Dec. 31, 1905, of \$92,850,000, this being the largest amount ever returned in profits by any incorporated mining company. Dividends for 1905 were \$5,000,000. Largest year's dividends were \$10,000,000, in 1899. Paid a \$15 dividend, March, 1906. Controls three subsidiary corporations, organized 1905, known as the Frontenac Copper Co., Gratiot Mining Co. and Manitou Mining Co. Had a balance of quick assets, for fiscal year 1905, of about \$7,000,000.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$ 1,200,000.00
Entire amount invested in real estate.....	18,961,784.33
Amount of personal estate.....	7,067,831.52
Amount of floating debt.....	1,257,271.98
Amount due company.....	3,041,520.63

Consideration will be given first to the Calumet & Hecla mine proper, which includes about 2,750 acres, lying in a compact tract in Sections 11, 13, 14, 15, 22, 23 and 24, Town 56 North, Range 33 West, Houghton county, Michigan. The company also owns considerable tracts west of the Tamarack mine, carrying the underlay of the Calumet conglomerate; at such stupendous depth that its opening would require a vertical shaft of about two miles in depth. The lands west of the Tamarack were explored, 1904, with diamond drills, in search of a supposed cupriferous conglomerate. The Metalline and Dover tracts, area 200, acres, lying next south of the Tecumseh, were bought 1904. The company also owns extensive tracts of timber land in Michigan and Wisconsin, in addition to the enormous landed holdings of the three subsidiary corporations.

The Calumet & Hecla mine proper is opened on the Calumet conglomerate, which to the north and south has proven unprofitable wherever mined, though the underlay of the lode, opened by vertical shafts, at the Tamarack

mine, has given good returns. The conglomerate has an average strike of N. 39° E., with average dip to the north of west of 37° 30' with the horizon. The lode has 8' minimum and 40' maximum width, with an average of about 12' to 14', giving about 2,400 cubic fathoms of stoping ground, equal to circa 43,200 tons of stamp-rock, per acre of area. The Osceola amygdaloid, outcropping 730' east of the Calumet conglomerate, underlies the entire main tract of the Calumet & Hecla, having a strike parallel to the conglomerate, with an average dip of about 40°. The Kearsarge amygdaloid, which is rich to the northward, also underlies the Calumet & Hecla lands, outcropping some distance east of the Osceola lode. The Calumet amygdaloid, lying between the conglomerate and the Osceola amygdaloid, has been little opened, but might prove payable, if developed, as it shows some rich ground in a crosscut from the 900' level.

The Calumet & Hecla mine in reality is many mines in one. The Calumet mine at the north, the Hecla in the center and the South Hecla at the south, form one continuous mine developing the Calumet conglomerate by incline shafts, the Red Jacket shaft opening the same lode vertically. The Osceola amygdaloid bed is opened by 5 shafts, and the Kearsarge amygdaloid lode is being opened by three shafts. The mine has 21 shafts, of which 15 are working, 2 are idle and 4 are permanently abandoned. The conglomerate, opened for two miles along its outcrop, has 11 shafts, 8 being single-compartment size, which means single hoisting compartments, two with double compartments, and one vertical shaft with 6 compartments. The 5 Osceola shafts and 3 Kearsarge shafts have double compartments each. The trap and amygdaloid walls of the conglomerate carry considerable copper, especially the foot-wall bed, and much of the adhering trap rock formerly rejected is now milled.

The incline shafts on the conglomerate are worked as two separate mines, known as the Hecla and Calumet branches, the South Hecla being a southerly continuation of the Hecla branch. The shafts on the outcrops are as follows, from north to south: Nos. 6 and 5 Calumet, two compartments each; No. 4 Calumet, one compartment, with a vertical depth of 4,748' and an actual depth of 8,100' at an angle of 37° 30', in addition to which there is a winze of 190' from the bottom, giving a total depth of 8,290' from the collar of the shaft to the bottom of the winze; No. 3 Calumet, abandoned; No. 2 Calumet, with one compartment 7,000' deep and nearing the boundary; No. 1 Calumet, abandoned; No. 1 Hecla abandoned; No. 2 Hecla, 4,400' deep, bottomed at the Tamarack boundary; No. 3 Hecla, 4,000' deep, also bottomed at the Tamarack boundary; No. 4 Hecla, abandoned; No. 6 Hecla, one compartment, 6,200' deep, with ground to sink to 8,500'; Nos. 7 and 8 Hecla, one compartment, 6,300' deep and can sink to 9,000'; Nos. 9 and 10 Hecla, two compartments, 6,500' deep and can go to 8,100'; No. 11 Hecla, 2,400' deep, with poor ground at bottom, and being gutted from the bottom up; No. 12 Hecla, at the company's south line, 6,700' deep and bottomed in unprofitable ground.

Pillars 75' wide are left on either side of every shaft, and when the present conglomerate workings are exhausted, down to the Tamarack line, the pillars will give a product equal to about 18% of all the rock mined previously. The

mine is opened for about 8 years in advance of immediate requirements, possibly too far ahead for such soft ground, and has about 200 miles of shafts, drifts, winzes and crosscuts. The quantity of timber used in the mine is about 30,000,000' annually. Electric pumps are in use on the 48th level of No. 7 Hecla, and elsewhere.

As a rule the richer portions of the conglomerate are in the central part of the Calumet & Hecla tract, the most notable exception being in No. 4 Calumet shaft. Nos. 11 and 12, the southernmost shafts of the South Hecla, are being gutted, pillars being robbed from the bottom upward. Hecla shafts 6, 7 and 8 show very good ground. To the north of No. 5 Calumet there is a considerable stretch of lean ground, up to the north boundary.

The Calumet & Hecla has suffered severely from underground fires. The amygdaloidal trap rock carrying native metal cannot burn, like copper ore mines rich in sulphur, such as the Anaconda, United Verde, Mountain and others, but the old timbering eventually becomes nearly as inflammable as so much tinder. The really serious mine fires have been five in number, occurring in 1884, in July and November 1887, and on Nov. 30, 1888, and May 27, 1900. All possible precautions are taken against mine fires, these including the partial fire-proofing of all mine timber with chloride of zinc solution, regular sprinkling of all shafts, the maintenance of water-pipes and hydrants, fire-hose, chemical engines, an electric alarm system and 18 telephones at various pump stations, from the 8th to the 51st levels, inclusive, in five different shafts, so distributed as to be most readily accessible from all parts of the mines. From the first four fires the Calumet & Hecla suffered aggregate losses of several millions of dollars, while a number of lives were lost, and three valuable shafts were drawn so badly that they were abandoned. The fifth and latest fire, in May 1900, severely tested the mine's system of fire prevention and extinguishment, the fire breaking out on Sunday evening, when the mine was deserted by all but a few employees, and gaining great headway before it was discovered and the burning portion of the mine shut off by closing the fire-doors. The mine was sealed at surface, by covering the mouths of the shafts with heavy timbers, and tamping dirt tightly into the crevices between. Wherever gas escaped through holes in the earth, dirt was tamped in and luted with water. The fire was extinguished in three weeks, and the South Hecla portion of the mine continued working without interruption. The five serious fires, and sundry smaller blazes nipped in their inception, all have been of mysterious origin, and there are grounds for suspecting incendiarism. Great precautions are taken to prevent unauthorized persons entering the mine, and permission to go underground is given only by the president, in writing, each pass being for one trip only.

The Red Jacket vertical shaft, 4,920' deep, started 1888, cut the lode at a depth of 3,287'. When first bottomed, the rock temperature in the sump was 87° Fahrenheit (31° Centigrade), but after connection was secured with No. 4 Calumet shaft, the temperature was reduced to between 70° and 80° Fahrenheit, exhaust air from the power drills aiding in cooling the mine. The Red Jacket shaft was designed to open a mine unconnected with the older

workings, in order to give reserve stopes in case of a mine fire, but the heat and danger were so great that connection was made with the older shafts. The conglomerate lode at this point and depth is not up to its usual value, being wide, but below the average content in copper. It is evident, from the results secured by this and the other deep shafts of the district, that while the cupriferous stratified beds may descend to tremendous distances, the copper values grow less at depth. The Red Jacket shaft hoists rock from all the north shafts below the 56th level, at which point the conglomerate is intersected. In the two eastern compartments of this 6-compartment shaft are two 9-ton Kimberley self-dumping skips, swung under the cages. The two western compartments have double-deck cages for men and material, and the two middle compartments have cylindrical steel bailers, which have given good results in freeing the mine of water. Electric turbine pumps were tried experimentally in this shaft, in 1904, with satisfactory results and it is probable that these will displace the boilers for unwatering the mine. By releasing these two compartments for hoisting purposes, the shaft can be given a daily hoisting capacity of better than 4,000 tons of ore. Iron pillars are used extensively, as supports, in portions of the crosscuts connecting the shaft with drifts on the lode, and also in various incline shafts to support the hanging wall. Iron also is used for lagging, to some extent, material being mainly scrap, such as worn-out skip-rails, cut to 10' lengths and placed above "1" beams. The Red Jacket shaft has 9-ton steel storage-bins at its various productive levels, aiding in maintaining the uninterrupted hoisting service that is absolutely necessary in a mile-deep shaft. The cages are fitted with tail-ropes, these materially modifying the unpleasant and even dangerous vibration formerly noted in the hoisting cables.

The Calumet & Hecla owns 200 acres, known as the "five forties," between the Tamarack and the Tamarack Junior mines. These lands carry the underlay of the conglomerate at great depth, and to obviate sinking a deep and costly vertical shaft, this tract is being opened by a blind shaft, which starts 1,500' east of the Red Jacket vertical, and near the bottom of Calumet No. 4, which abuts on the Tamarack boundary line at a depth of 8,100'. No. 4 has opened some of the best ground of the entire mine, the lode having an extreme width of nearly 40' at points, and being notably rich from the 3,600' to the 4,500' level. The blind shaft is being sunk 25' under the footwall, at the same angle as the dip of the conglomerate, thus assuring solidity of walls without necessitating long and expensive crosscuts to the lode on each level. A "footwall drift" on the 57th level parallels the regular drift, at a distance of 25' in the footwall, between the Red Jacket vertical and the blind shaft, thus obviating the confusion almost certain to result were the regular drifts given double duty. The blind shaft starts from the footwall drift under and parallel with the 57th level, and will be about one mile in depth, opening four of the five 40-acre tracts, leaving the fifth and last to be opened by sub-shafts from the blind shaft. Owing to the regular incline shafts being sunk on the dip of the lode, while the blind shaft must follow the section lines, it descends diagonally on the dip of the lode, giving an average dip of about 22° only, although

the lode dips at $37^{\circ} 30'$. This flat incline permits the hoisting of rock in tram-cars, which are hauled through the blind-drift and dumped in the steel bins of the Red Jacket shaft for hoisting, thus saving transfer at the mouth of the blind shaft. The showing in the blind shaft is satisfactory, the lode averaging 14' width, with about 10' fairly mineralized. The Tamarack Junior mine of the Osceola Consolidated, which adjoins the "five forties," is drained by holes bored by a diamond drill from the blind shaft, obviating possible damage by flooding from the abandoned Tamarack Junior workings.

During 1905 the 5-ton skips used in the three of the incline shafts on the conglomerate lode were replaced by $7\frac{1}{2}$ -ton skips. The other working shafts probably will have similar skips later, providing a 50% increase in hoisting capacity, the engines being amply powerful to meet the increased duty.

It is planned to crosscut eastward to the Osceola and Kearsarge lodes from the 49th level of No. 2 shaft, which will give the deepest level cross-section in the district.

Shafts 13, 14, 15, 16 and 17, numbered from south to north, are on the Osceola amygdaloid lode, a cupriferous bed outcropping 730' east of the Calumet conglomerate, these beds being practically parallel in strike and nearly parallel in dip. These shafts are of 1,400' average depth each, and have about 20 miles of openings on the Osceola bed, with frequent connections, by crosscuts, between the conglomerate and amygdaloid workings. The Osceola shafts were closed 1901, and remained idle until 1904, when No. 13, the southernmost, was reopened. No. 14 shaft, 3,200' north of No. 13, was reopened 1905. A new concrete foundation has been built under the hoist. No. 15, 2,600' north of No. 14, probably will go into commission during 1906. No. 16, 1,800' north of No. 15, went into commission early in 1905, and at the end of the year was running 22 power drills and stoping about 250 tons daily. No. 17, 1,800' north of 16, is idle, and likely to remain so for some time, as the hoist was removed to No. 21, late in 1905. No. 18 is merely the site for the ultimate northern shaft on the Osceola lode, upon the Calumet & Hecla tract. The laterals in the Osceola workings are carried as drift-stopings, along the hanging wall, to a height of about 12'. With selection the Osceola rock is running about 22 lbs. fine copper per ton.

The Kearsarge lode outcrops about 2,200' east of the Osceola amygdaloid, and 2,930' east of the Calumet conglomerate, with which beds it is parallel in strike and nearly parallel in dip. The work of permanent development was begun on this bed August, 1903. The Kearsarge shafts are numbered from north to south, No. 19 being about 1,000' south of the north boundary line, and at the close of 1905 was 600' deep, with the first level opened at 180', and subsequent levels at intervals of 110'. The openings are somewhat erratic, but fairly satisfactory, showing good stamp-rock, carrying probably 18 to 22 lbs. fine copper per ton, with reasonable selection. This shaft is a new departure in Lake mining practice, being "timbered" with steel, brick and concrete. The shaft has 3 compartments, 2 for hoists, and the hanging wall is lined with 3 arches of brick, laid in 3 to 5 courses, thickness being increased

with depth, supported by two rows of steel "I" beams, serving also as dividers for the shaft.

No. 20 shaft, 2,400' south of No. 19, and similarly "timbered", was about 500' deep at the close of 1905.

No. 21, 8,000' south of No. 20, was but fairly started at the close of 1905. Considerable difficulty was experienced in locating the southern extension of the Kearsarge lode for this shaft, a drift from the temporary exploring shaft being sent in the wrong direction. Dr. A. C. Lane, state geologist, was called into consultation, and, by following his advice, the Kearsarge amygdaloid bed was located in a few hours—a very considerable triumph for the believers in scientific geology. The shaft is constructed similarly to Nos. 19 and 20, and, at shallow depth, shows well in copper. A permanent hoist, taken from No. 17 and good for one-half mile depth, was installed late in 1905. Results at the Kearsarge shafts were somewhat indifferent, until late in 1905, when an improvement was noted in both Nos. 19 and 20. About 15 drills are employed in the Kearsarge shafts, and small rock shipments are made, mainly for test purposes. The Kearsarge shafts have permanent equipments, with railroad tracks, and are connected with the compressed air mains of the company's system.

The shaft-rockhouses at the conglomerate incline shafts are of uniform pattern. At each the rock is hoisted to the top of the shafthouse, passing thence over grizzlies that allow the finer rock to fall through, the larger masses being reduced in 24x36" jaw crushers, and going to 18x24" crushers on the floor beneath. The crushed rock falls by gravity into storage bins, whence it is dumped into hopper-cars that take it to the mills, railroad tracks running underneath each rockhouse.

The electrification of the mine was begun, March, 1906, when electric motors were installed in the rockhouse at No. 2 Calumet shaft. At the Red Jacket vertical shaft the collar has been enclosed and a ventilating chimney added, doing away with the ice formerly resulting in winter from the steam arising from the mine.

The surface equipment of Calumet & Hecla is the most complete owned by any mine. With rare exceptions, everything is duplicated, to prevent possible delays or suspension through fire or accident. The carpenter shops are of great size and fitted with every modern wood-working appliance. The smithies are larger than may be found elsewhere outside, of the works of a few of the very largest machinery manufacturers, and are supplied with steam-hammers, forges, blowers, emery-wheels, grindstones, etc. The Calumet smith shop sharpens upwards of fifty tons of steel drills daily, requiring the services of a small regiment of drill boys for transport between the shops and mines, while forging and general blacksmithing are done at the Hecla shops, to which a stone addition of 56x152' was built in 1903. Upwards of one hundred blacksmiths are employed in the various shops. The machine shop, 225x250', is very complete in equipment, turning out an immense variety and quantity of work. The company has a very large brick warehouse, for general supplies, and special warehouses for steel and iron, paints,

etc., all having direct connection with the Hecla & Torch Lake Railroad, a private line operated by the company, that connects the mine, mill and smelter by some 20 miles of main track, spurs and sidings, reaching every shaft, shop, warehouse and mill. The road has big locomotives and a large equipment of rolling stock. It is planned to add an iron foundry, which may be installed during 1906.

The power plants at the main mine on the Calumet conglomerate include six hoisting plants and four large boiler plants. The hoisting engines of the conglomerate mine are among the most powerful in the world, ranging from 1,000 to 8,000 h. p. each. Miners are taken in and out of the incline shafts by man-cars, these being long trucks having tiers of circus seats, and replacing the regular skips when needed, being quickly shifted on or off the skip-tracks by powerful cranes. This method has proven the safest, cheapest and quickest yet devised, for moving men in and out of deep incline shafts.

At No. 4 Calumet shaft there is a group of the most powerful machinery ever built. The brick engine-house, 62x146', contains the 4,700-h. p. Corliss engine "Superior," with 40" cylinders and 72" stroke; the auxiliary engines "Baraga," and "Rockland," of 2,000 and 600 h. p. respectively; two Rand air-compressors, of 25 and 40 drill capacity, and the engine "Mackinac," a 7,000-h. p. quadruple-cylinder triple-expansion steel giant, operating three Nordberg air-compressors with a combined capacity of 500 drills. In the old Leavitt compressor, water was injected into the compression cylinders, while the Nordberg machines deliver the compressed and greatly heated air to a cylindrical steel cooler, 12' in diameter and 30' high, into which water is sprayed from above and drawn off at the bottom, this cooling the air to 80° F. (27° Centigrade). The hoist has 4 drums, each 8' 6" wide and 20' 6" in diameter, operating 4 different shafts, 2 of these drums carrying nearly 2 miles of steel cable each. Power is supplied by batteries of boilers in two boiler-houses adjoining, these having a brick chimney 250' high, with inside diameter of 12' 6". Locomotives haul the coal into the boiler-houses, where it is fed to the grates by automatic stokers.

The Hecla engine-house, of brick, 47x80', flanked by a large boiler-house, contains the 2,000-h. p. compound hoisting engine "Frontenac" and two auxiliary engines of 600 and 900 h. p., also a 30-drill Rand air-compressor and a pair of water-plunger air-compressors with combined capacity of 144 drills—the largest machines of this type ever constructed.

South of the Hecla plant is the engine-house known locally as the "G. H. & S.," from the initials of its three former engines, the "Gratiot," "Houghton" and "Seneca," of 2,000 h. p. each. The "Gratiot" was remodeled and removed to the stamp mills in 1902, and alterations made on the "Houghton" and "Seneca" enable them to do the work formerly requiring three engines. The Hecla boiler-house has 5 large boilers and a 200' smokestack, of 9' 6" internal diameter.

The engine-house operating Hecla shafts 7 and 8 contains the engines "Hancock" and "Pewabic," each of 2,000 h. p., which operate 25' drums by spur gearing, and a 5,000-h. p. Leavitt engine for man-cars. A 50x120'

boiler-house has 10 boilers and a 250' smokestack of 12' 6" internal diameter.

The engine-house serving shafts 9 and 10, South Hecla, contains the engines "Detroit" and "Onota," of 1,000 h. p. each, and the engine-house at shafts 11 and 12 has Lidgerwood hoists of similar capacity.

The Red Jacket shaft has an 8,000-h. p. quadruple hoist, housed in a 70x220' brownstone building, and in an adjoining brownstone building, of 70x150', with a 250' smokestack of 12' 6" inside diameter, are ten 1,000-h. p. boilers. At the rear of the engine-house is a 32x412' brownstone annex, floored with cement and roofed with slate, in which is carried the fleet-gear. In raising ten-ton loads perpendicularly from a depth of one mile, the weight of the cage and steel cable nearly equals that of the cargo of rock, but with the aid of counterbalance the engines can hoist ten-ton loads at a speed of 40 miles per hour, the regular hoisting time being about 90 seconds for the vertical distance of nearly a mile, this including time taken for starting and stopping, an achievement no locomotive could duplicate on a horizontal plane. The engine operates on the well-known Whiting system, devised by S. B. Whiting, formerly general manager of the company. To overcome the dangerous strain caused by unequal wearing, Walker differential rings have been placed on the sheaves, with excellent results, the cables taking 4 complete turns around the driving sheaves. The Red Jacket steel combination shaft-rockhouse, 100' square and 110' high, is fitted with breakers capable of crushing 2,000 tons of rock daily.

The engine-houses on the Osceola lode have steam and air connections, and the Kearsarge shafts have air connections with the main power plants at the conglomerate shafts. Shafts Nos. 13, 14 and 15 have powerful permanent hoists, while No. 16 has a temporary hoist only. Shafts 13, 14 and 15 have large stone engine-houses, while 16 and 17 have temporary engine-houses only. The Osceola shafts are supplied with permanent shaft-rock-houses, of the standard Calumet & Hecla size and equipment.

Among miscellaneous surface improvements at the mine is a 74x74' stone building housing the electric power and lighting plant, a timber-mill that mortises and tenons the bed-pieces, legs and stulls of the square sets used underground, a large paint-shop, oilhouses, barns, etc., and a private telephone exchange with 100 instruments.

The Calumet & Hecla owns about 1,200 houses, occupied by employees at an average rental of 6% interest on actual cost, plus cost of maintenance, and about 1,200 dwellings are owned by employees, on lands leased from the company, at low yearly rentals. The company also maintains a large hotel and a fine stone clubhouse for employees, the latter containing bath-rooms, bowling alleys, etc. A free library of more than 16,000 volumes contains books printed in a score of languages, 30 different nationalities being represented on the company's payroll. There also is a combination library and clubhouse, at Lake Linden, for stamp-mill and smelter employees. There are some 30 churches on Calumet & Hecla lands, occupied by a dozen different denominations, and for all these churches sites were donated, and in most cases substantial aid has been given in their erection and maintenance, en-

tirely regardless of creed. There are eight schoolhouses on the Calumet & Hecla lands, most of which were built by the corporation, including several large and substantial structures.

The company maintains a hospital, for employes solely, built in 1898 and noted for its complete surgical and laboratory apparatus. Nearly a dozen physicians on the hospital staff are at the call of any employe requiring medical or surgical attendance.

An aid fund for employes, instituted 1877, and managed by directors chosen by the workmen, pays death and disability benefits, enormous sums having been disbursed since the formation of the fund, every dollar going to the sick and injured, or to families bereaved of their bread-winners by accident or disease. Surplus monies accumulated in this fund have been invested in the company's shares, bought on the open market, and these investments have been highly profitable. Disbursements from this fund are \$50,000 to \$75,000 yearly, and the nominal value of the fund, at the end of the fiscal year 1904, was \$112,498, actual value being much greater, as all stock is inventoried at cost price. For the maintenance of this fund each employe pays 50 cents monthly, and the company adds an equal amount.

Three systems of waterworks are maintained, two at Calumet and one at Lake Linden. One of the former furnishes water from dams for fire protection, and the other pumps potable water 4 miles from Lake Superior, against a head of 600', raising about 4,000,000 gallons daily. At the dam and mine there are 7 pumps, with a combined daily capacity of upwards of 45,000,000 gallons. The Lake Superior waterworks are to have electric power.

The company maintains a fire department, modeled on metropolitan lines, which affords protection to the mine buildings and location, and also responds to calls from the town of Calumet, with 40,000 people, that has grown up about this great mine.

The stamp-mills are located at Lake Linden, four miles from the mine, on a tract of 988 acres, which has several miles of frontage on Torch Lake. There are two mills, the "Calumet" and "Hecla," each of which originally had 11 Leavitt steam stamps, with cylinders 14x21½" and 24" stroke. An addition to the southern end of the "Hecla" mill is 165x308', of steel, built by the American Bridge Co. This has 6 stamps, each run by an independent 25-h. p. electric motor. Among the new features are 7 Chilean regrinding mills, in addition to the old Averly grinders, and enlarged finisher jigs. The new plant handles material with about 60% of the wash-water formerly required, thus effecting a double saving, inasmuch as all water used in the mills must first be pumped in, and thereafter raised as sludge in the sand-wheels, when discharged.

The rebuilding of the two old mills was begun upon completion of the new mill, in 1903. Each mill was divided into two sections, and one section rebuilt at a time, each requiring approximately one year for completion. None of the old structures are used, and but fragments of the old material, the "remodeled" mills being new mills standing upon the old sites. Wood

has been replaced throughout by steel and cement. Foundations are much heavier, and the wash-room below the heads has been greatly increased. The rebuilt sections have foundations of very massive piles, 20' apart, two and three tiers driven to bed-rock and topped with 6x12" square timber, capped by a 4' 6" bed of concrete. The new sections, built by the Wisconsin Bridge & Iron Co., have heavy steel frames. The rebuilt mills are equipped with Leavitt stamps, concrete foundations, cement floors, corrugated iron siding and Carey roofs of tarred burlap, Woodbury-Benedict jigs, 4-deck Evans-Rawlins slime-tables, of which there are 10 auxiliary to each stamp, Chilean regrinding mills, classifiers and Wilfley concentrators, the latter built in the Calumet & Hecla shops, by special arrangement with the owners of the patents. The mills are to have 220 Wilfleys eventually, these effecting a considerable saving of very fine copper formerly lost, and greatly reducing the mill's water consumption. A Robins belt conveyor, in the Calumet mill, is used for carrying barrel copper from the heads. The third section was nearing completion early in 1906, and the fourth and final section should be completed, or nearly so, by the end of 1906. The mills contain 28 Leavitt stamps, but owing to the rebuilding under way, only 24 heads were in commission or available in March, 1906, and of these several were used for experimental purposes, or were out of commission temporarily. The mill has one Nordberg steeple-compound head, worked under test, with steam fed from a separate boiler. A very exhaustive test is being given this stamp. The new heads can treat about 400 tons of Calumet conglomerate rock, or 550 tons of Kearsarge amygdaloid rock, daily, these being about the two extremes of rock crushed in the district. President Agassiz has stated that the new mills will pay for themselves by one year's work, on which basis the entire job is already paid for, before finished. The superior efficiency of the new mills is evidenced by the greatly increased copper production of 1905, and will be more apparent in the future.

Water for the mills is supplied by five pumps, of which the "Michigan" is the most powerful in the world, having a daily capacity of 60,000,000 gallons. The daily capacity of the engines "Huron" and "Ontario" is 20,000,000 gallons each, of the "Erie" 10,000,000 gallons, and an I. P. Morris pump can raise 22,000,000 gallons daily.

As the mills stand on the flat western shore of Torch Lake, but little above water level, tailings speedily filled the shallow lake for some distance off shore, and to waste the sand it became necessary to secure a considerable initial elevation, which is gained by sand-wheels. The material entering the mills as conglomerate rock leaves as coarse sand, to the extent of fully 6,000 tons daily. The sludge is washed through launders to the sand-houses, where it is scooped up by the buckets of the wheels and dumped, high above, into launders running on trestles far out into the lake, these spouting forth miniature brick-red Niagaras. There are two wheelhouses, one for each mill. The Calumet wheelhouse has sand wheels of 40' and 50' diameter, and the Hecla wheelhouse, caring for the sands from a much larger mill, has sand-wheels of 40', 50' and 64' diameter, the latter being housed

in a three-story steel annex, 65x78' on the ground and 94' high. The old wheelhouses are of wood, iron-sheathed. The steel in the annex to the Hecla wheelhouse weighs 490 tons, and the building is equipped with a 45-ton Sellers traveling crane. The sand wheel is to appearance a gigantic bicycle wheel, fitted with a spur gearing where the rubber tire should be. The complete wheel weighs 500 tons, and is mounted upon massive concrete masonry. Four 25-ton iron bed-plates support the pillars carrying the 21-ton Krupp forged steel axle, which is 27' long and 32" in diameter with a hollow core of 26" diameter. Radiating from axle to rim are 2" steel spokes 32' long. The rim is in 20 segments weighing 10,700 lbs. each, the inner perimeter of the wheel having 550 buckets, in pairs, each 3' wide and 4' 6" long, and holding 100 gallons, giving the wheel a capacity of 55,000 gallons per revolution. The completed wheel is 10' wide and 64' in diameter, driven by gear and pinion, power being furnished by a 700-h. p. dynamo. Nearly two years were required to build and adjust this monstrous wheel.

The boiler plant at the mills has 22 boilers, of which an average of 14 are kept under steam. There are four 250-h. p. boilers, thirteen 300-h. p. boilers and five 500-h. p. boilers, giving a total steaming capacity of 7,400 horse power. Daily coal consumption averages 240 tons at the stamp-mill power plant. The combination boiler-house and smithy, 50x100', is of steel. The boilers at the mill consume about 500,000 gallons of water daily, secured from a reservoir, artesian wells and Torch Lake. Trouble from impure water has been solved by the installation of a Jewell filtration plant, of 500,000 gallons daily capacity, in which the impurities originally found in the water are precipitated by lime.

Miscellaneous buildings at the millsite include a 48x175' warehouse, machine shop, carpenter shop, paint shop and sundry smaller buildings.

It was decided, in 1904, to substitute electric energy for steam power, wherever practicable. In the case of some of the big compounded hoists, the change would be of doubtful economy, as well as necessitating enormous initial outlays, but in the case of much of the machinery electricity will effect large savings in operating costs. The central power station is located at Lake Linden, near the mills, a 120' steel addition being built to the old electric building of 45x85' with a 45x60' wing. This originally had two engines, the "Saginaw" and "Gratiot," the latter connected with the generator by rope belting. The "Saginaw" is an Allis-Chalmers twin vertical tandem compound-expansion direct-connected engine, having cylinders 17x40x48", with a speed of 95 revolutions per minute. Each engine drives a 1,000-kilowatt alternating current generator, furnishing energy for the new Hecla sand-wheel, new Hecla mill, electric lights and sundry other uses. Work on the new building was begun 1904, the structure was completed 1905, and power from the new plant will be available at mines, mills and smelter in the summer of 1906, poles having been set and a transformer house built at the mine in 1905. The advantage of locating the central power plant at Lake Linden is that coal can be delivered alongside, from the largest vessels plying the great lakes, effecting a saving of

about 10 cents per ton on transportation costs, for coal now burned at the mines, and much more in the case of certain isolated plants, such as the waterworks plant on Lake Superior, which has no rail connection. There also will be the saving in slack resulting from one less handling of the coal. Some of the present steam installations consume as much as 4 lbs. coal per h. p. hour, whereas the new electric plant will require approximately $1\frac{1}{2}$ lbs. per h. p. hour. There are many other economies that will result, as, for instance, in labor, the company now employing 100 firemen in its various power plants. The annual coal consumption of the property is about 225,000 tons, and the new plant will effect a very large saving in fuel and in operating costs.

The completed central electric plant will have, in addition to the original 2,000-h. p. installation, the Leavitt engines "Owego" and "Ontonagon," of 3,000 h. p. each, built for hoisting purposes, which will be direct-connected to 2,000-kw. generators. There is room for a third 2,000-kw. generator, which will give a total capacity of 8,000 kilowatts, equal to upwards of 10,000 horse power. It is probable that an idle engine will be brought from the mine for the third 2,000-kw. generator.

The tailings at the Lake Linden mills are the most extensive in the world, containing upwards of 30,000,000 tons of stamp sand, carrying from about 0.1% copper, in the newest parts, up to nearly or quite 1% copper, in the older sections. The total amount of copper in these sands is probably fully 200,000 tons. Experiments at reworking have been made from time to time, without success. Between the included copper, which necessitates regrinding, and the oxidation of the metal, which is rapid, the problem of economical extraction is not simple, and yet lacks a solution.

The Torch Lake smelter is at Hubbell, about one mile south of the mills. The site is 30 acres, with ample water-frontage and shipping facilities, having deep water in front and three railways at the rear. The plant includes 4 furnace buildings, each 80x130', and a 50x70' blister-copper furnace building. Both the reverberatory and water-jacket blast furnaces have been rebuilt to larger size, within the past few years. The new reverberatories have 93' stacks, and are top-charged, having platforms above, on which the mineral is thoroughly dried before smelting. The largest blast-furnace is 40x96" at the tuyeres, the comparatively small size being due to the use of reverberatory furnaces for the bulk of the smelting work required in the comparatively simple process of reducing the native copper mineral produced by Lake Superior mines. The practice at the smelting plant is fully abreast of the times, in all essentials.

There are three mineral-houses, with a combined storage capacity of 18,000 tons. The mineral now carries approximately 65% copper only, being dressed much lower than formerly, to effect the saving of the very fine copper previously lost in the slimes.

The power plant at the Lake Linden smelter has three 125-h. p. boilers, and a fourth boiler, in the cupola building, generates steam by the combustion of waste gases from the reverberatory furnaces. A small electric

plant has an 85-kw. generator, with a 25-kw. generator in reserve, as an auxiliary.

The two-story assay office and laboratory, 40x42', with a 14x14' wing, is exceptionally well arranged and complete in equipment. There also is a large warehouse and an office building at the smelting plant.

The eastern reduction plant, at Black Rock, Buffalo, N. Y., is known as the Buffalo Smelting Works.. It is located on the Niagara river, with deep water in front and direct rail connections in the yards. The plant is well arranged, but has grown to nearly the capacity of its site, and soon will need more room. A 30-ton electrolytic refinery, originally installed partly for experimental purposes, has grown to large size, and now treats a considerable proportion of the Calumet & Hecla copper. Formerly the high-grade mineral was shipped to the Buffalo works for smelting, but at present all grades of mineral are treated at both plants. The deeper workings of the Calumet & Hecla yield arsenical copper, and this requires electrolytic refining, by means of which considerable silver, formerly lost, is now saved.

The Buffalo works, which employ about 150 men, include reverberatory and blast-furnace buildings, electrolytic plant, two large mineral-houses, office, laboratory and coal-hoists. Sufficient mineral is shipped to the Buffalo works, during the open season of navigation, to keep the plant operating steadily from December till May, while lake navigation is closed. The Calumet & Hecla operates a fleet of steel steamers and barges, for carrying mineral east and bringing coal cargoes back to the mines in return, the fine steel steamer, Geo. A. Flagg, of 3,300 tons register, being of this fleet.

The dock system of the Calumet & Hecla is extensive, and includes a series of very large coal-sheds at Lake Linden, with one of 200,000 tons capacity, the old sheds being of wood and the new of steel. There is a series of docks at the mills and smelts on Torch Lake, all with substantial wharves having at least 21' of clear water alongside, frequent dredging being required to maintain this depth of clear water, owing to stamp-sand filling in. The wharves were extended, 1904-1905, both at Lake Linden and Hubbell. The 750' coal wharf has 11 Hunt hoists and three 52' movable derricks, one of wood and two of iron. The Calumet & Hecla owns and operates the ship-canal connecting Torch Lake with the government waterways on Portage Lake, this canal being 21' deep and accommodating the largest vessels plying the great lakes. Tolls, ranging from 10 cents on soft coal to 50 cents per ton on package freight, are charged by the company, on independent cargoes entering Torch Lake through this canal.

A sawmill, at the head of Torch Lake, receives logs by raft and ships sawed lumber and timber by a branch of the company's railroad. At the mouth of the Sheldrake river, on Whitefish Point, Chippewa county, Michigan, the company has a mill sawing about 12,000,000 feet of lumber yearly, with about 8 years' supply of standing timber tributary thereto. The company also has a mill at Ashland, Wisconsin, and owns extensive tracts of pine, hemlock and hardwood at various points along the southern shore of Lake Superior, in addition to which much timber is bought of jobbers, the company's re-

quirements for underground timbering alone being about 30,000,000' annually, in addition to the many millions of feet of timber and lumber used on surface, at the mines, mills and smelters.

Within the past five years the policy of the Calumet & Hecla has been greatly changed. Almost from its birth the mine was the greatest copper producer of the world, and the most profitable mine of any metal. The company was progressive, and led the van in the introduction of heavy mining machinery, and in many other respects, but, with all its progressiveness, the management fell into a rut. This fact finally became apparent to the directorate, and with the new century came a new policy—one that has worked wonders in five years, and will work greater wonders in the years to come. The Calumet & Hecla mine proper had at least thirty years of life remaining, and could have continued to earn four to eight million dollars annually for that period, but it was felt that the future must be assured, and that so magnificent a corporation be not permitted to wind itself up by the exhaustion of its original mine. For five years the energies of the company have been bent upon betterments in every department, and upon the development of new mines to replace the old. A quarter century is a long time to look ahead, but this is what the officials of this company are doing, and have been doing for the past five years, and it is this unusual foresight that stamps the management as one of most unusual ability.

There is glory enough for all connected with the mine in the achievements of the past five years, and there are few in positions of responsibility who are not entitled to credit, but the praise must be given mainly to Col. Livermore and Mr. MacNaughton. The result of their labors, while plainly perceptible to close observers for two years past, is just becoming apparent to the world at large, the first public declaration of the new Calumet & Hecla being found in the magnificent production of 1905, which not only was the largest in the history of the mine, but raised it from fourth place, in 1903, to first place, in 1905, among the copper producers of the world.

With so large a concern as the Calumet & Hecla, employing thousands of men, earning annual profits of millions of dollars, and representing an investment of scores of millions, growth must be along carefully considered lines, to be effective. There has been growth during the past five years, and it has been well-balanced, affecting every department of the company. The mining plant has been brought to a higher degree of efficiency, new mines are being opened parallel with the old mine, the stampmills have been rebuilt, one section at a time, improvements have been made in the smelters, upon the railroad and in the wharves. Timber supplies for the far future have been looked to, and the electrification of the mine provided for. Operating costs per ton of product have been largely reduced, without cutting wages, and while charging millions direct thereto for new equipment. Despite decreased percentage of copper, due to deepened mines, the cost of making a pound of copper has been reduced from almost 11 cents, in 1901, to about 7 cents, in 1905.

The achievements that have been merely enumerated by heads, in the foregoing paragraph, would be ample glory, but even greater things have been

done. The Calumet & Hecla has branched out in every direction, in the Lake Superior copper belt. It has acquired tens of thousands of acres of mineral lands, in the three counties of Houghton, Ontonagon and Keweenaw. This has been done skilfully, at very reasonable cost, and with a remarkable absence of publicity, considering the watchfulness with which maneuvers of so great a corporation are regarded by thousands of curious, keen and frequently jealous eyes. The delicate work of examination and negotiation has been greatly facilitated by the esprit du corps and loyalty which are such notable features of the Calumet & Hecla force.

By a change made in the Michigan laws, in 1905, the Calumet & Hecla was enabled to modify its charter, and is allowed to hold stock in other corporations. This has permitted the Calumet & Hecla Mining Company to secure control of other mines and mineral tracts, in two ways, one being the organization of subsidiary companies controlled or owned outright, while the second plan permits the securing of control by purchase of majority interests in promising new properties that require money for development purposes. The company now controls three directly subsidiary corporations, these being the Frontenac Copper Co., Gratiot Mining Co. and Manitou Mining Co. The two first named companies are owned outright, except necessary founders' shares, and the Manitou is owned except a 10 per cent. interest. A controlling interest, to the extent of 51%, is held in the Superior Copper Co., which is opening a promising mine on the northern extension of the Baltic lode, near Houghton, under an option expiring Sept. 1, 1906, which may be extended to the end of the year, and negotiations are under way for similar arrangements with other new companies. The Manitou is opening a very promising mine on the old Delaware property. All of the subsidiary corporations will be found described, under their respective titles. Through the Frontenac, Gratiot and Manitou companies, the Calumet & Hecla has secured control, in Keweenaw county alone, of about one hundred square miles of mineral lands, and in addition has bought numerous other mining properties in Houghton county, and is supposed to have secured control of the Nonesuch mine in Ontonagon county. The earnings of the Calumet & Hecla are so large that the company can, with ease, set aside a million dollars or more yearly, for exploratory and development work on these new lands, while maintaining regular dividends. The economies effected in five years, at the Calumet & Hecla proper, would provide the million dollars yearly, and leave twice as much for the shareholders.

Detailed figures of production and dividends by years will be found in the statistical chapter. The statistical confusion so frequently noted in figures of Calumet & Hecla production is caused by the use of four sets of figures of production of refined copper, to say nothing of two sets of figures of output of crude mineral (unsmelted copper), and numerous estimates of more or less authenticity. The four sets of official figures of annual production are for actual output of refined copper, and also quantity of fine copper contained in mineral produced, for the calendar year, and also for the company's fiscal year. Figures used in this publication are those of actual outputs in refined copper

by calendar years. At the close of 1905 rock production was at the rate of about 6,600 tons daily, of which about 6,000 tons came from the conglomerate, about 500 tons from the Osceola amygdaloid workings, and about 100 tons from the shafts on the Kearsarge amygdaloid. The completion of the final section of the mills will add about 20% to the milling capacity, and improvements at the mine will permit a daily production of at least 7,500 tons, and possibly as much as 9,000 tons daily, an increase of 25% to 50% on the tonnage of 1904. The increased ore production is reflected by the greatly increased output of fine copper, which was 95,100,610 lbs. in 1905, as against 80,341,019 lbs. in 1904. For 1906 the output of fine copper should exceed one hundred million pounds, for the first time in the history of the mine, leaving the Anaconda the only competitor for the first place among the world's copper mines, while for 1907 a further increase should be shown, with every likelihood of steady growth in future years.

To those who have read the foregoing description of the Calumet & Hecla, no word of commendation of mine or management will be required. The facts carry their own eulogy.

CALUMET, HECLA & MUSCATINE MINING CO.

Office: Cass Avenue and Second St., St. Louis, Mo.

CALUMET MINING CO.

COLORADO.

Office: 2 Toltec Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Rollinsville, Boulder Co., Colo. Emerson J. Short, president and general manager. Main shaft, 100', is said to show a 2' paystreak of auriferous and argentiferous chalcocite assaying 25% to 40% copper.

CALUMET MINING, MILLING &

COLORADO & WYOMING.

SMEETING CO.

Mine offices: Montezuma, Summit Co., Colo., and Encampment, Carbon Co., Wyo. T. H. Andrew, president; Prof. E. O. Perisho, vice-president; O. L. Andrew, second vice-president and secretary; Ernest Foster, consulting engineer. Capitalization \$500,000, shares \$1 par. Lands, 3 claims, area circa 50 acres, adjoining the Charter Oak, with about 200' of shafts and open-cuts. Also owns the Waterloo group, in Summit county, Colorado, which has produced high-grade silver-lead ores in the past, and is claimed to have \$75,000 worth of ore, running \$35 to \$150 per ton, blocked out for stoping. Apparently the copper claims, in Wyoming, are idle.

CALUMET & MONTANA DEVELOPMENT CO.

MONTANA.

Dead. Former office was at Calumet, Michigan.

CALUMET & MONTANA MINING CO.

MONTANA.

Office: care of Chas. Chynoweth, secretary, Calumet, Mich. John Daniell and Paul P. Roehm, directors; Fred Reuther, consulting engineer. Capitalization \$300,000, shares \$1 par. Lands, 6 claims, area 120 acres, in Beaverhead county, Montana, located in the Copper Queen district, near the Idaho line. Mine has tunnels of 125' and 160', showing a 5' fissure vein carrying auriferous and argentiferous chalcocite and bornite. A test shipment, to Salt Lake, gave smelter returns of 18% copper, \$4 silver and \$66 gold per ton. Company has purchased and will install boilers, air-compressor

and power drills, and expects to begin ore shipments early in the summer of 1906. Management is good and property considered promising.

CALUMET & ONTARIO DEVELOPMENT CO. ONTARIO.

Office: Calumet, Mich. Mine office: Massey Station, Algoma, Ontario. Lands are sundry copper claims near the Hermina mine. Idle.

CALUMET & OREGON MINING CO.

Organized, 1905, under laws of Maine.

CALUMET & PINAL MINING CO. ARIZONA.

Mine office: Red Rock, Pinal Co., Arizona. Mott Guild, manager. Lands, sundry claims in the Owl Head Mountain range, 18 miles northeast of Red Rock, opened 1879, which produced about \$35,000 in ore values, when worked by chloriders, in the past. Is sinking a shaft and plans installing steam power.

CALUMET & PITTSBURG DEVELOPMENT CO. ARIZONA.

Reorganized, December, 1903, as Calumet & Pittsburg Mining Co.

CALUMET & PITTSBURG MINING CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Arizona. Chas. Briggs, president; James Hoatson, vice-president; Thomas Hoatson, 2d vice-president; Louis W. Powell, 3d vice-president and general manager; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thos. F. Cole, Chas. d'Autremont, Jr., Chester A. Congdon and Geo. E. Tener, directors; Henry B. Paull, auditor. Employs 150 men. Organized December, 1903, as successor of the Calumet & Pittsburg Development Co., with capitalization \$2,500,000, shares \$10 par, full paid and all issued, 50,000 shares in the treasury having been issued pro rata among shareholders at par, 1905. Annual meeting, second Monday in April.

Lands, 21 patented claims, area 325 acres, adjoining the Copper Queen, Calumet & Arizona, Lake Superior & Pittsburg, Pittsburg & Duluth and Junction mines, with which four last-named companies the Calumet & Pittsburg is closely affiliated, having the same officers and with which three last-named companies it is proposed to amalgamate in 1906. Cost of lands was \$937,451.75, paid in cash. Ended 1905 with a cash balance of \$108,408.71. Development is by two shafts. The 4-compartment Briggs shaft, 1,159' deep, lies about 3,000' south of the Junction shaft and about 3,000' east of the Lowell shaft of the Copper Queen, both of which shafts are drained by the Briggs, which is very wet, entailing costly pumping. In September, 1905, this shaft was forking out nearly 5,000 gallons per minute. The first level, at 910', shows 600' of leached ore and soft material, of the sort which has been found capping the big ore bodies of adjoining mines, and this drift has cut the tops of 3 ore bodies of 5' to 17' width, carrying 10% to 20% ore. A 20" diamond drill hole has penetrated considerable high-grade ore, and a winze on this level, east of the Briggs shaft, is sinking in soft leached ore. A plat was cut for the 1,150' level, February 1, 1906, and it is expected that the drifts on this level will develop workable ore bodies. The shaft has an 8" air-line and two 12" water-columns. The shaft has three pumps, of which 2 are Prescotts. On surface is a steel gallows-frame and a power-plant

with 7 boilers, of which 5 are of 250 h. p. each, burning crude petroleum. There also is an 18-drill air-compressor.

The 4-compartment Hoatson shaft, on the Del Norte claim, about 2,500' from the Briggs shaft, was 1,180' deep on May 1, 1906. This was sunk 162' in December, 1905, which is the camp record for rapid sinking, and possibly a world's record as well. This shaft will begin drifting at 1,150' and practically is assured of good ore, developments in the Lowell shaft of the Queen being favorable up to the Del Norte boundary line. The Lowell shaft is draining much of the water in this district, but the Hoatson is liable to catch both water and ore at a little greater depth, the shaft being bottomed in very promising material. Equipment includes a 50' gallows-frame and a double-drum hoist, good for 1,500', brought from the Junction shaft.

The Junction shaft is sunk on the boundary line of the Calumet & Pittsburg and Junction mines, to develop both, and a drift from this shaft on the 900' level enters the Ormond claim of the Calumet & Pittsburg, with a promising showing of leached ore.

The management of this company is excellent, and while developments to date have failed to open the big ore bodies confidently expected, the showing remains encouraging, at the different points of attack.

CALUMET & SAULT STE MARIE DEVELOPMENT CO. ONTARIO.

Office: Calumet, Mich. Letter returned unclaimed from former mine office, Massey Station, Algoma Ontario. Fred. Roehm, president; Wm. F. Ashton, superintendent. Lands, sundry claims, near the Hermina, opened by a 100' main shaft, said to show a 14' vein carrying auriferous chalcopyrite.

CALUMET & SONORA MINING CO. MEXICO.

Office: 610 First National Bank Bldg., Duluth, Minn. Mine office: La Cananea, Sonora, Mexico. J. E. Cooley, president; Marcus L. Fay, vice-president; Hubert V. Eva, secretary; Chas. W. Ericson, treasurer; Jas. A. Daugherty, superintendent. Organized 1902, under laws of Minnesota, with capitalization \$300,000, shares \$10 par. Lands, 70 pertenencias, area 173 acres, in three adjoining groups, nearest about 5 miles from La Cananea, slightly developed by shafts of 50', 65' and 193', and a 90' tunnel. Country rocks are mainly limestone and porphyry, with promising copper outcrops. Main shaft shows good copper-silver ore, but is very wet. Idle at last accounts, but company plans resuming work in spring or summer 1906.

CALUMET & TEXAS MINING CO. TEXAS.

Office: Cedar Rapids, Iowa. Mine office: Carlsbad, N. M. John H. Shary, president and general manager; Wm. Fullerton, secretary; Alfred C. Sieboth, consulting engineer. Organized, May, 1901, under laws of New Mexico, with capitalization \$250,000, shares \$1 par. Lands, 36 claims, area 720 acres, also 640 acres of oil lands, in the Guadalupe Mountains, El Paso county, Texas, showing an ore body giving assays of 20% copper, 5% lead and 1 oz. silver per ton, with a trace of gold, from carbonate ores, opened by tunnels of 40', 200', 210' and 328'. Nearest railroad, the Pecos

Valley & Northeastern, is 64 miles distant. Test shipments of 23 tons of ore sent to the El Paso smelter, gave returns of 19% to 24% copper. Idle.
CALUMET & WESTERN DEVELOPMENT & MINING CO.

Office: 400 Fifth St., Calumet, Mich. F. S. Carlton, president; John Daniell, secretary; W. B. Anderson, treasurer. Organized 1903, under laws of Arizona, with capitalization \$6,000,000, shares \$10 par, in 100,000 shares of 7% preferred stock and 500,000 shares of common stock. Present holdings include the Globe zinc mine, near Joplin, Missouri.

CALUMET & YAQUI RIVER COPPER CO. **MEXICO.**

Office and mine: La Cananea, Sonora, Mexico. H. C. Rolfe, president; Geo. H. Nolte, secretary; W. J. Elliott, treasurer. Organized April 28, 1903, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. Apparently is the same as Santa Marguerite Mining Co., and is supposed to have purchased the mines of the Venice Copper Co., area 85 pertenencias, 7 miles from Soyopa, Sonora, Mexico. The Venice property was alleged to have possessed a 50-ton smelter, and to be opened by a 1,200' tunnel, showing good copper ores.

MINA CAL VERDE. **MEXICO.**

Office: care of Chas. A. Green, owner, Mill City, Nev. Lands, 17 pertenencias, in the Sierra de los Arrados, district of Bravos, Chihuahua, Mexico, showing limestone impregnated with copper stains, carbonates and oxides, traversed by a porphyry dike, with a heavy iron capping. Idle.

MINA CAMAQUAN. **BRAZIL.**

Mine office: Camaquan, Rio do Sul, Brazil. Was said, 1905, by Bureau of American Republics, to be yielding 30% copper ore.

CAMBRIAN CONSOLIDATED MINES, LTD. **WALES.**

Wound up, September, 1904.

CAMBRIAN COPPER MINING CO., LTD. **WALES.**

Voluntarily wound up, February, 1903.

CAMBRIAN MINING & MILLING CO. **CALIFORNIA.**

Mine office: Placerville, El Dorado Co., Cal. F. Thomas, president; Leonard Thomas, general manager; D. R. Roberts, superintendent. Organized 1898. Mine, originally opened, circa 1855, for gold, has 3 parallel veins, averaging 6' to 8' width, with gangue of talcose schist and lime, between diorite and serpentine, showing cuprite, malachite and sulphide ores, with native copper in the alteration zone, ores carrying 8% to 16% copper and good gold values. Has 3 tunnels and a quarter mile of drifts.

CAMBRIDGE COPPER MINING CO. **NORTH CAROLINA.**

Dead. Formerly had a mine near Jamestown, Guilford Co., N. C.

CAMERON MINES. **ARIZONA.**

Sold, 1902, to Canyon Copper Co.

MINAS DE CAMPANARIO. **SPAIN.**

Office: care of Don Antonio Guijarro Orta, Huelva, Spain. Mine office: Valverde del Camino, Huelva, Spain. Lands are a group of 6 properties, area 87 hectares, on which iron-copper sulphides were being developed, at last accounts.

CAMP BIRD EXTENSION MINING CO.**COLORADO.**

Office: 302 Boston Bldg., Denver, Colo. Mine office: Ouray, Ouray Co., Colo. F. L. Siegel, president; F. J. Campbell, secretary, treasurer and manager; M. L. Thistle, superintendent. Has water and electric power. Mine idle, and company likely to lose property, unless additional funds are secured.

SOCIEDAD ANONIMA COBRES DE CAMPÓO.**SPAIN.**

Office: Santander, Spain. Mine office: De Soto, Santander, Spain. Don Alberto Gutiérrez, president; Don Luis Torres Quevedo, secretary. Property is a group of idle copper mines.

CAMPRODEN COPPER SYNDICATE, LTD.**SPAIN.**

Offices: 3, Lord St., Liverpool, Eng. Moribund.

CAMPERDOWN GROUP.**WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. Lands, sundry claims, north of the Cumberland group, on the southern slope of Coad Mountain. Is said to have a good showing of copper ore, somewhat resembling that of the Cumberland group.

CAMP VERA GROUP.**CALIFORNIA.**

Lands are in the Morrow district of San Bernardino county, California. Letter addressed to J. W. Rodgers, owner, Barstow, Cal., returned unclaimed.

CANADIAN-AMERICAN MINING CO.**BRITISH COLUMBIA.**

Lands, sundry claims, on Gribble Island, off the coast of British Columbia. Idle.

CANADIAN CONSOLIDATED MINES, LTD.**BRITISH COLUMBIA.**

Title changed, 1906, through supplementary letters patent, to Consolidated Mining & Smelting Co. of Canada, Ltd.

CANADIAN COPPER CO.**ONTARIO.**

Office: 43 Exchange Place, New York. Mine office: Sudbury, Algoma, Ont. A. P. Turner, president and general manager; John Lawson, superintendent; David Browne, smelter superintendent. This is the world's largest producer of nickel, and is controlled by the International Nickel Co., through ownership of nearly the entire stock issue. The property was discovered in 1882 and opened in 1886. Lands are extensive, including the Creighton mine, worked open-cast, now the largest producer, the Stobie mine, in Blezard Twp., 4 miles north of Sudbury, the Evans, McArthur 1 and 2, McDonald, Clara Belle A and B, and other mines, in addition to the older and principal workings at Copper Cliff, the Copper Cliff mine being opened to the 14th level. Ore is nickeliferous chalcopyrite, with pyrrhotite gangue, occurring as irregular lenses in basic igneous rocks, mainly greenstone and diorite. Ore is heap-roasted at the Copper Cliff mine, and matted at the Sudbury smelter, 3 miles distant. The roast-heaps contain 4,000 to 5,000 tons each, roasting requiring three to four months. Latterly a considerable proportion of green ore is mixed with the roasted ore, in smelter charges. The first fusion product is a matte of 30% to 35% tenor in combined nickel and copper, the second fusion giving an 80% matte, which is shipped to the Orford works, at Constable Hook, N. J., and smelted with sulphite of soda,

by which the separation of the nickel and copper is effected, the resultant copper product being refined electrolytically. The ore gives average returns of about 2.75% copper and 5.5% nickel.

The new smelter, of brick and steel throughout, has storage bins of 2,000 tons capacity, material being handled from mines to smelter, and at the latter, by two 80-ton locomotives, hauling 50-ton drop-bottom dump-cars. The new smelter has two furnaces of 500 tons capacity and a converter plant, power being almost exclusively electric, generated by a central steam plant, to be replaced by electricity. The Huronian Company, a subsidiary corporation, is completing a powerful electric installation at High Falls, on the Spanish river, 4 miles north of the Canadian Pacific Railway, with dams estimated to impound water sufficient to generate 11,000 horse power, which installation eventually is to be doubled.

In smelting, the company's new plant has taken many ideas from the Tennessee Copper Co. and the Mond Nickel Co. The use of mixed charges of raw and roasted ore is a modification of the new Tennessee process, while the Mond process is utilized in bessemerizing the matte carrying about 80% of combined nickel and copper. In addition to treating ores from its own mines, the company does a custom smelting business. The new reduction works include a 100-ton arsenic plant, with condensation chambers for crystallization of the arsenical fumes. The new plant is treating auriferous mispickel, bought from the Big Dan and Leckie mines, in the Nett Lake district, paying therefor 95% of the assay values in gold, 35c. per lb. for cobalt, 12c. per lb. for nickel and 1c. per lb. for arsenic. Production 1905, was 4,743 short tons nickel, valued at \$1,516,747, a falling off of 2,255 tons from 1903, and 4,326,000 lbs. fine copper, as against 8,010,000 lbs. in 1903. The production, which has been below normal for 2 years, should show a large gain in 1906.

CANADIAN MINING & DEVELOPMENT CO.

MONTANA.

Letter returned unclaimed from former mine office, Basin, Jefferson Co., Mont. Lands, 10 claims, showing gold, silver, lead and copper ores.

CANADIAN NICKEL CO.

ONTARIO.

Letter returned unclaimed from alleged works office, Sault Ste Marie, Algoma, Ont. Was said to have leased the reduction plant of the Lake Superior Corporation, and plans refining nickel and copper by a new electric process.

CANADIAN SMELTING WORKS.

BRITISH COLUMBIA.

Works office: Trail, Yale district, B. C. W. H. Aldridge, general manager; Jules Labarthe, superintendent. Is owned and operated by the Consolidated Mining & Smelting Co. of Canada, Ltd. Is the largest lead-copper reduction plant in Canada, with 1,200 tons daily capacity, and employs 350 men. Power is furnished by electric current, brought about 30 miles from the Kootenay river, a line current of 20,000 volts being stepped down to 550 volts at the smelter, giving a total of 1,000 h. p. in motors, divided into 16 units. The plant treats custom ores extensively, these coming mainly from Rossland. Plant includes a 100-ton Gates crusher, 3 Vezin automatic samplers, Jones riffle sampler, 24 roast-stalls, 19 calciners

and three 300-ton copper furnaces, with automatic feed. Ore and fluxes are handled in hopper-cars, drawn by 10-h. p. electric locomotives. The first fusion matte contains 10% to 12% copper only, which is granulated and roasted in two O'Hara furnaces, after which the calcined matte is briquetted and resmelted to a second matte averaging 50% in copper tenor. The final product is blister copper. The works include a very complete lead-smelting plant, handling silver-lead-zinc ores, equipped with an electrolytic lead refinery, the first ever built. During 1905 the works treated 240,000 tons of ore, producing therefrom 4,571,764 lbs. fine copper, 13,382,050 lbs. lead, 1,359,911 oz. silver and 82,644 oz. gold, with a total value of \$3,475,747.29, and also refined \$320,000 worth of bullion from other works. Plant is well equipped, and smelting and refining practice are modern and efficient.

CANANEA CONSOLIDATED COPPER CO., S. A.

MEXICO.

Office and mine: La Cananea, Sonora, Mex. This company, incorporated under Mexican laws, holds direct title to the mines of the Greene Consolidated Copper Co., the Greene company owning the entire stock issue of the Cananea Consolidated.

CANANEA & DULUTH DEVELOPMENT CO.

MEXICO.

Organized May, 1905, with capitalization \$400,000, shares \$10 par. Apparently was succeeded, circa 1906, by Cananea-Duluth Mining Co.

CANANEA-DULUTH MINING CO.

MEXICO.

Office: Hibbing, Minn. Mine office: La Cananea, Sonora, Mex. Geo. McMillan, president; Walter J. Power, vice-president and general manager; S. L. Proctor, treasurer. Capitalization \$500,000, shares \$1 par. Property is entirely paid for and company was out of debt, in spring of 1906. Lands, 50 pertenencias, lying about 1,000' east of the Cobre Grande shaft of the Greene Consolidated, extension of vein of which is supposed to be carried. Property is known as the Dos Naciones, and is being developed by 2 shafts, of which No. 1 shows low to medium grade ore on the 100' level, toward the American property. The claims have not been sufficiently developed to pass upon their value, but indications are of a favorable nature.

CANANEA & EASTERN MINING CO.

MEXICO.

Office and mine: La Cananea, Sonora, Mex. J. J. Williams, president; E. P. Draper, secretary; M. J. Thomas, treasurer; L. P. Nash, superintendent. Organized September 9, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Mexican corporation is the Cananea Eastern Mining Co., S. A. Lands, 149 pertenencias, in 2 groups. La Zona group, area 49 pertenencias, lies about 8 miles southeast of Douglas, Arizona. La Princesa and La Costoza groups, area 100 pertenencias, are in the Ajo Mountains, 21 miles east of Cananea. Latter group, opened by a 180' tunnel, showed promising sulphides at the end of 1905, and a 40' shaft gave handsome oxide ores and bornite, averaging about 10% copper, with small gold and silver values. Property is considered promising.

CANANEA EASTERN MINING CO., S. A.

MEXICO.

Is the Mexican incorporation of the Cananea & Eastern Mining Co.

MINA CANDELA.**MEXICO.**

A property in the state of Michoacán, México, said to possess a large body of low-grade sulphide ore. Local conditions are supposed to be much the same as at the Inguarán.

MINA CANDELARIA.**MEXICO.**

Mine office: Chacalá, Durango, Mex. Is owned and managed by P. G. Dismukes, T. L. Dismukes and J. S. Wilkinson. Ores are bismuthiferous and carry gold, silver and copper values. Has steam power, Bryan mill and a 6-ton chlorination plant.

CANDELARIA MINING CO.**MEXICO.**

Office: 100 Broadway, New York. Mine office: San Pedro, Chihuahua, Mex. E. D. Morgan, president; C. J. Reeves, secretary; N. C. Thompson, general manager; David B. Smith, superintendent. Is the principal mining company of northern Chihuahua, employing about 1,200 men. Lands, circa 1,700 pertenencias, area approximately 4,200 acres, also sundry grazing and miscellaneous lands, the mine tract being about $\frac{3}{4}$ mile wide by 5 miles long. Principal development is on the northern portion of the tract, with the 703' San Pedro shaft, 700' Candelaria shaft, 600' San Nicolás shaft and 500' Congreso shaft. Sundry other mines, including the Cobriza, have shafts of 175' to 350' depth, the company's mines having a total of about 3,200' of shaft development, with circa 25,000' of underground openings all told.

Country rocks are porphyry, diorite and limestone, ore bodies being somewhat erratic. The San Pedro is the oldest mine and has produced the highest grade ore. The Candelaria is now the largest and steadiest producer of high-grade ore, shipping selected ore of first grade giving average smelter returns of approximately 20% lead, 10% zinc, 8% copper, 400 oz. silver and 0.5 oz. gold per ton. The San Nicolás produces silver-lead and copper, latter as chalcopryrite. The Congreso mines mainly lead carbonates. Mines are wet, and company is installing a pumping plant of 3,000,000 gallons daily capacity. The company formerly operated a copper matting furnace at the mines, hauling coke therefor 90 miles in wagons, from Villa Ahumada, on the Mexican Central Railway, but later a railroad was built to Juárez, opposite El Paso, where a reduction plant, including concentrator and smelter, was built. This plant was sold to the Guggenheims, and Candelaria ores now are treated at the Aguascalientes works of the American Smelting & Refining Co. The Candelaria is a dividend-payer, and has an excellent management, both general and local.

CANDELARIA MINING & EXPLORATION CO.**MEXICO.**

Dead. Lands sold to Mexican Standard Mining Co.

CANTON MINE.**GEORGIA.**

An old and idle property in Fannin county, Georgia. Main shaft, about 300'. Ores occur as chalcopryrite impregnations in micaceous schist.

CANYON COPPER CO.**ARIZONA.**

Office and mine: Grandview, Coconino Co., Ariz. Jno. H. Page, president and general manager; H. H. Smith, secretary and treasurer; John

Curran, mine superintendent. Organized 1902, under laws of Arizona, with capitalization \$600,000, shares \$10 par. Lands, 10 claims, area 200 acres, also a 10-acre millsite, in the Grand Canyon of the Colorado river. Veins are contacts between limestone and porphyry, giving average assays of circa 30% copper, from cuprite, melaconite, malachite, azurite and chalcopyrite. Property, discovered 1892, was bought, 1902, by present owners, from the Last Chance Mining Co. Produced circa 350,000 pounds of copper in 1904, from about 550 tons of ore smelted. Property apparently is of considerable promise.

CANYON GOLD & COPPER CO.

MONTANA.

Office: Helena, Mont. Canoll & Martin, managers; A. W. Martin, superintendent. Property is in the vicinity of Canyon Ferry, Lewis & Clark county, Montana, and has been a small shipper of smelting ore, averaging about 22% copper, with fair gold values. Presumably idle.

CANYON MINING CO.

ARIZONA.

Supposed to have been organized, circa 1905, as successor of the Black Canyon Copper Co., Ltd., which went out of business suddenly, without paying its debts.

MINA CANZA.

PERÚ.

Office and mine: care of A. Garland y Ca, owners, Canza, Ica, Perú. An old property, and once a considerable producer. Numerous cupriferous veins, in igneous rocks, carry bodies of ore that are oxides and carbonates above and sulphides below the water level. Has 3 principal veins, opened to depths of 700' on the Adelaide, 1,000' on the Consolador, and 500' on the Tapadita, the latter mine having been the largest producer in the past.

SOCIETA DELLE CAPANNE VECCHIE e

ITALY.

POGGIO BINDO.

Mine office: Massa Marittima, Grosseto, Italy. Cesare Martelli, superintendent. Property is sundry ancient mines, reopened 1846, since which time they have been small but steady producers. Principal vein is 6" to 50' wide, ore being mainly chalcopyrite, which is sorted into two grades, the first grade, of 11% average tenor, being smelted, while the second grade, carrying about 3% copper only, is heap-roasted and leached.

CAPE BRETON COPPER CO., LTD.

NOVA SCOTIA.

Office: 308-53 State St., Boston, Mass. Mine office: Coxheath, Cape Breton Co., N. S. John C. Watson, president; Isaac P. Gragg, secretary; J. Dorr, treasurer. Capitalization \$2,000,000. Property is the old Coxheath mine and adjoining lands, 10 miles from Sidney, Cape Breton, showing several cupriferous veins, of which the principal, averaging 10' width, traverses felsite and diorite, carrying argentiferous and auriferous chalcopyrite, in a silicious gangue, ore averaging about 4.5% copper. Idle.

CAPE COPPER CO., LTD.

CAPE COLONY & NEWFOUNDLAND.

Offices: 9, Queen St. Place, London, E. C., Eng. Mine offices: O'okiep, Little Namaqualand, Cape Colony, and Tilt Cove, Newfoundland. Edmund A. Pontifex, chairman; John Taylor & Sons, managers; Percy John Frank, secretary; J. L. Dean, mine manager in South Africa. Organized

April 30, 1888 (as a reconstruction of the Cape Copper Mining Co., Ltd. organized 1863), with capitalization £750,000, in £150,000 of 6% cumulative £2 preference shares and £600,000 in £2 ordinary shares; issued, £590,000. Dividend payments in 1901 were £224,250; in 1902 there was a net loss of £6,494; in 1903 a net profit of £95,979; in 1904 a net profit of £183,795 and in 1905 a net profit of £263,562. Dividends were 13s. in 1901, 5s. in 1903, 8s. 6d. in 1904 and 13s. in 1905. Annual accounts are made up to April 30, at the Cape, and to August 31, in London, and submitted in December. Separate accounts are kept for the Tilt Cove.

The Tilt Cove mine, in Newfoundland, is held on a 99-year lease, expiring 1989, at an annual rental of £4,400, plus one-half of net profits. The East Mines of the Tilt Cove produce sulphide ores averaging 3% to 3.5% copper, with small gold and silver values, while the West Mines have much smaller ore bodies, but of higher grade, averaging about 11% copper. Production 1904, was 73,500 long tons of ore, averaging 3.72% copper, equal to 6,122,000 lbs. fine copper and in 1905 the Tilt Cove made 5,104,960 lbs. fine copper. Ore was mined at an average cost of only \$1.72 per ton. Ore reserves in the Tilt Cove mines are estimated at 125,000 long tons.

Company also is entitled to one-half the net profits of the Briton Ferry Chemical & Manure Co., Ltd., which takes the sulphurous gases given off by the smelters of the company's works at Briton Ferry, England. The Kjøli Mines, in Norway, have been given up. A Chilean property, held under option, was surrendered also, not proving satisfactory, and company is said to have an American mine under option.

The principal mines of the company are in Little Namaqualand, Cape Colony. The older of these, which are the O'okiep and Spektakel, were opened in 1852. Ores of the South African group are mainly chalcopyrite, with some bornite and chalcocite, intimately associated with pyrite, and showing occasional cuprite and malaconite, with a little malachite, azurite and crysocola, near surface. The ore bodies are irregular, massive deposits of pyritic ores, associated with basic igneous intrusions in the granite and gneiss country rocks.

The O'okiep remains the principal African producer, but its ore reserves dwindle yearly, foreboding final extinction, being estimated by the company at only 6,000 long tons of 21% ore, in 1905. Production, 1905, was 6,117,440 lbs. fine copper. The O'okiep East mine is producing a limited amount of low-grade ore.

The Nababeep mine, opened 1890, is a good producer, furnishing 5% ore, and showed improvement in 1905. Reserves are estimated at 150,000 long tons of 5% ore. No. 4 trial shaft is being sunk on the Nababeep, the ores of which mine are intimately mixed with the greenstone, appearing as bunches and veins in the richer portions only. Production, 1905, was 5,136,320 lbs. fine copper.

The Narrap is a comparatively new property, which is showing fair ore. The Spektakel mine has ores occurring in both the granite and the basic intrusive rocks. Both the Spektakel and Koperberg mines are idle.

The Carolusberg East mine is undergoing development, and explorations were resumed at Coetzee's mine, 1905. On the whole the outlook at the South African mines is not especially reassuring, owing to failure to develop good new mines to replace the O'okiep.

There is a smelter at O'okiep, which is thoroughly modern in equipment, except that it lacks converters, product being shipped to Swansea as a 50% matte. Smelting is done for the Namaqua Copper Co., Ltd., which sells ore to the Cape Copper Co., Ltd., under contract. The mines and smelters are connected with Port Nolloth by a 100-mile railway, and at the port there are docks, wharves, cranes, tugs and lighters, for the receipt and dispatch of freight. Production, for the calendar year 1905, from all mines, was 16,358,720 lbs. fine copper. The company is an old and important producer, with a highly honorable history, and it is to be hoped that its efforts to find payable new mines may be successful.

CAPE D'OR COPPER DEVELOPMENT CO.

NOVA SCOTIA.

Mine office: Cape d'Or, Cumberland county, Nova Scotia. Idle.

CAPE NOME GROUP.

Office: care of H. T. Wilkinson, owner, Missoula, Mont. Mine office: Clinton, Missoula county, Montana. Employs 5 men. Ole Erickson, superintendent. Lands, 7 claims, area 85 acres, partly patented, in the Wallace district, showing 5 fissure veins in granite, and one contact vein between granite and quartz-porphry, of which 2 are being developed, these averaging 8' between walls and giving average assays of 7% copper, 13 oz. silver and \$1 gold per ton, from bornite, chalcopryite and tennantite, with occasional small particles of native copper. Has shafts of 40', 70' and 300', and tunnels of 75', 350' and 850', latter in ore for 775'. A test shipment of 30 tons gave average returns of 7.5% copper, 15 oz. silver and \$1 gold per ton. Management plans installing steam power and an air-compressor.

CAPILLITAS COPPER CO., LTD.

ARGENTINA.

Offices: 6, Princes St., London, E. C., Eng. Mine office: Cerro de Capillitas, Tucumán, Argentina; Works office: Pilciao, Catamarca, Argentina. Geo. Grinnell-Milne, chairman; Nicol Brown, vice-chairman; J. G. Tait, secretary; J. S. MacArthur, consulting engineer; G. Le Royer, general manager. Organized November 25, 1901, with capitalization £600,000, shares £1 par, in £150,000 cumulative 7% preference shares, £150,000 cumulative 7% ordinary shares, and £300,000 deferred shares; issued, £585,000.

Lands are extensive, including the Capillitas and Atajo groups of mines, and the Pilciao and Constancia smelters, bought for £95,000. Company also has sundry lands fairly timbered. The Capillitas group of about 20 properties, district of Andalgalá, in the eastern part of the province of Catamarca, shows 12 veins. Principal developments by the former owners were on the Restauradora, Rosalia, Carmelita, La Grande and Oritz mines. These are being reopened by two tunnels, under the old workings at La Grande, and by one new tunnel, in the Restauradora. Ore from develop-

ment work has averaged about 15% copper, with good gold and silver values, being buncy as a rule, but high in grade. The Atajo mines, 6 miles north-west of the Capillitas, have a smelter with 6 small reverberatory furnaces. The Maria Eugenia vein is about 7" wide, giving 10% ore—not sufficient to pay, unless the vein grows much wider.

These mines are much the most important in Argentina, and have been worked irregularly, by local capital, since circa 1850. One of the principal difficulties in operation has been defective means of transport, as the mines are located in exceedingly rugged mountains, necessitating the shipment of ore to smelters by pack-mules. The mines are 8,000' above sea-level, and more than 6,000' above the temporary smelters and shops at Pilciao. The nearest railroad station is Chumbicha, 165 kilometres distant, over exceedingly rough and dusty roads. A traction-engine was tried, but stuck in the sand. The government has promised to extend the Córdoba Central railroad to Andalgalá, but the line is not likely to arrive until circa 1908. To cover the worst stretch between the mines and smelters, a single-line aerial tram has been ordered. This will be 22 miles in length, and the longest span is to be 2,765', while in crossing one valley the cable will swing 625' above the ground. The plant will weigh 2,000 tons, and is made in sections, for convenient packing on muleback. This tramway is designed to carry 40 tons of ore hourly, at a speed of 2.5 metres per second, cars being of 500 kilos capacity. It is hoped to have the tramway completed in 1907. The tramway will leave a 20-mile gap between Pilciao and Muschaca, over which transportation will be by carts.

The permanent smelter, with two 50-ton water-jacket blast-furnaces, is to be erected at Muschaca Quebrada, where there is plenty of room and water. About 225 h. p. will be generated from the Rio Andalgalá, and transmitted to the new smelter-site electrically. The new smelting plant has a $8\frac{1}{2}$ -kilometre pipeline, with dam, filter and tanks. The old Constanancia smelters, with 2 reverberatory furnaces, have been overhauled, and in 1903 made 61 tons of matte averaging 62% copper, 60 oz. silver and 2 oz. gold per ton. Ores smelted by present company have averaged about 23% copper, 20 oz. silver and 15 dwts. gold per ton, but the grade undoubtedly will decrease with regular production.

Development work, while planned along sensible lines, seems very slow. There are many difficulties in the way of conducting mining and smelting operations in so rugged a district, especially when difficult of access, but nearly five years of work, and a 100-ton smelter not yet blown in, is slow progress. Comparison may be made with the Cerro de Pasco Mining Co., which in the same time has installed an immense reduction plant, under difficulties fully as great as those that the Capillitas company has had to face.

CAP SHEAF COPPER & GOLD CO.

BRITISH COLUMBIA.

Said to have copper prospects on Texada Island, British Columbia.

CAPUZAYA MINING CO.

MEXICO.

Mine office: Parral, Chihuahua, Mexico.

CARAHYBA COPPER MINING CO.**BRAZIL.**

Mine office: Alagoinhas, Bahia, Brazil.

MINA CARAMBOLA.**MEXICO.**

Office and mine: care of D. Pablo Palacio, owner, Indé, Durango, Mex. Lands, 18 pertenencias, in two groups, opened by La Chusa shaft, 15 metres, showing a 10' vein of auriferous copper ore, carrying 4% to 30% copper and 30 oz. silver per ton. Average assay values range from 3.5% copper and 300 grams silver, in the argentiferous ore, to 14.5% copper and 100 oz. silver in the best copper ore. At close of 1905 mine was shipping 20 to 30 tons of ore daily.

CARBON COUNTY GOLD MINING & MILLING CO.**WYOMING.**

Mine office: Morgan, Carbon Co., Wyo. W. R. West, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has steam power and a 10-stamp mill.

CARBONATE & LAURA MINES.**COLORADO.**

Mine office: care of Hoffman Bros., owners, Crystal, Gunnison Co., Colo. Have gold-silver ores, carrying a little copper. Have water power.

CARDEÑAS COPPER CO.**ARIZONA.**

Absorbed, circa 1903, by Anita Consolidated Copper Co.

MINAS CARDENILLO y EL ARMADILLO.**MEXICO.**

Mine office: Tuxpán, Tepic, Mexico. Fernando Diaz, owner; A. C. Gonzales, manager. Produce silver-copper ores. Have steam power and employed 50 to 100 men, at last accounts.

CARIBBEAN MINING CO.**COLORADO.**

Office: Holyoke, Mass. Mine office: Ophir, San Miguel Co., Colo. Chas. E. Newton, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has water power and a 20-stamp mill.

CARIBOU GOLD & COPPER CO.**IDAHO.**

Office: care of Frank A. Putnam, Gray, Idaho. Organized September, 1903, with capitalization \$2,500,000, shares \$10 par, to develop claims 65 miles southeast of Idaho Falls, in Bingham county, Idaho. Said to have an 8' vein, traceable 3,000'. Idle.

CARIDAD COPPER MINING CO., LTD.**SPAIN.**

Offices: 20, Lawrence Lane, Gresham St., London, E. C., Eng. Mine office, Lozoyuela, Madrid, Spain. Robert Summerside Simpson, chairman; Geo. Thompson, secretary. Organized February 15, 1899, and capitalization increased, 1901, to £350,000, shares £1 par; issued, £75,492. Lands, 325 acres, including the Caridad, San Antonio and Descuido mines. Idle.

MINA CARIDAD.**SPAIN.**

Office: care of Don Carlos Lacone, agent, Sevilla, Spain. Was developing fair-sized bodies of chalcopyrite and iron pyrites, at last accounts.

MINA CARISA.**MEXICO.**

Office and mine: care of Carlos Blake, owner, Autlán, Jalisco, Mexico. Lands, 30 pertenencias, circa 30 miles west of Autlán, showing a 30' vein,

carrying auriferous and argentiferous chalcopryite. Has about 400' of openings.

CARISA COPPER & GOLD MINING CO.

UTAH.

Office: Salt Lake City, Utah. Mine office. Mammoth, Juab Co., Utah. Joseph E. Galigher, president; Henry S. Joseph, vice-president and general manager; Edw. H. Mead, secretary; F. J. Westcott, treasurer; preceding officers and Dr. E. D. Woodruff, directors; Ed. Hoffman, mine superintendent. Organized August, 1901, under laws of Utah, with capitalization \$500,000, shares \$1 par. Has levied assessments of \$30,000, and has paid a dividend of \$30,000, latter in 1902. Treasury showed a deficit of \$3,409, July, 1905. Stock is listed on the Salt Lake City mining exchange.

Lands, 8 patented claims, area 57 acres, adjoining the Centennial-Eureka, in the Tintic district, showing 6 veins, as fissures in limestone and as contacts between limestone and quartzite, three of which are more or less developed, these averaging about 4' width and giving average returns of circa 5% copper, 3 oz. silver and \$2 gold per ton, from oxide and carbonate ores. Has three shafts, including the 250' Carisa shaft and the 800' Spy shaft, with a 7,000' tunnel, and a total of about 5 miles of underground workings, estimated to show 80,000 tons of ore blocked out for stoping. Has a 100-h. p. steam plant, with 5 hoists, largest good for 1,500', and a 3-drill Ingersoll air-compressor. Buildings include several small shops and 10 dwellings. Company also has a small electric light plant and saw-mill. Production was 600,000 lbs. fine copper in 1904, and 400,000 lbs. in 1905. Company estimates 1906 production at about 1,200,000 lbs. Average cost of mining is about \$5 per ton, and of smelting \$4 per ton. At close of 1906 mine was developing a new and promising ore body.

CARLISLE COPPER CO.

MONTANA.

Dead. Formerly held lands at Butte, Silver Bow county, Montana.

CARMACK GOLD & COPPER MINING CO.

WASHINGTON.

Office: Arcade Bldg., Seattle, Washington. Mine office: North Bend, King Co., Wash. G. W. Carmack, president; L. O. Lane, secretary. Organized 1899, with capitalization \$500,000, shares 25¢ par. Lands, 5 claims, on the south fork of the Snoqualmie river, 22 miles northeast of North Bend. Has 375' of openings, showing veins of 12", 30" and 12', giving fair assay values in gold, silver, lead and copper. Presumably idle.

MINAS DE CARMEN.

CHILE.

Mine office: Carmen, Chañaral, Atacama, Chile. Simón Baldivieso, owner; Adriano Fernandez, manager. Lands, 15 hectareas, area 36 acres, including El Carmen, Carmela, Cardúmen, Mina Nueva, Araucana, Quíñazo Locura, Lautaro and other mines, showing two main veins, the Veta Manto ranging 4 to 12 metres in width, while the minor vein is 2 to 3 metres wide. Ores, in successive lenses along the veins, are oxides, carbonates and silicates, at and near surface, disseminated throughout the ferruginous gangue of the lenses. The Carmen mine shows an abundance of native copper, at approximately 200' vertical depth. The sulphide zone,

reached at a vertical depth of about 110 metres, shows rich altered sulphides, below which the ore is chalcopyrite, associated with arsenopyrite, disseminated in iron pyrites. El Carmen, the principal producer of the group, is opened by 2 shafts, 190 metres apart, sunk at an angle of 45°, on the vein, one being 85 metres and the other 190 metres in depth, shafts being connected by the extensive underground workings. The other mines are opened by various shafts, several having underground connections with the Carmen. The mines show reserves of about 75,000 tons of ore, ranging from 6% to 15% in copper tenor. Mine has good steam power plant, and employs about 100 men. Production, since 1895, has averaged about 6,000 tons of ore, averaging 10% copper, equal to circa 1,325,000 lbs. refined copper yearly, and by reason of the new plant, should be considerably increased, beginning with 1906.

MINAS EL CARMEN AMPLIACION.

MEXICO,

Mine office: Cerralvo, Nuevo León, Mexico. Marciano E. Villaneal, owner and manager. Ores are argentiferous copper and lead sulphides.

CARMEN COPPER MINES, LTD.

CHILE & NEWFOUNDLAND.

Offices: St. George's House, Eastcheap, London, E. C., Eng. Mine office: Cerro Blanco, Copiapó, Chile. Alfred Hambley Rowe, chairman; John Pye, secretary. Organized June 28, 1900, with capitalization £125,000, shares £1 par; issued, £75,307. Absorbed the Newfoundland Copper Co., Ltd., in 1901, thereby securing title to the Little Bay and Lady Pond copper mines, in Newfoundland, now idle. The Little Bay mine, operated 1878-1892, has a main shaft of 1,350' and a small smelter, and was a small but steady copper producer, when worked.

Chilean property includes the Perseverancia mine, at Guanaco, Taltal, the Carmen Bajo, in the Copiapó district, and the Bella Vista, Aguardos and other mines, in the Coquimbo district. The Copiapó properties are idle, but work was in progress in a small way on the other properties, at last accounts.

CARNARVON ASSOCIATED GOLD & COPPER MINES, LTD.

Organized January 31, 1903, under laws of Guernsey, with capitalization £10,000, shares 10s. par. No business done.

CARNATION MINING CO.

Has mining property in vicinity of Empire Flats, on the Colorado river, near Bill Williams Fork river, either in Yuma county, Arizona, or in San Bernardino county, California, and in 1905 planned combining with other companies, to erect a smelter at Empire Flats.

CARN BREA & TINCROFT MINES, LTD.

ENGLAND.

Office and mine: Carn Brea, R. S. O., Cornwall, England. Frank Harvey, J. P., chairman; T. Forster Brown, consulting engineer; John Trevethan, secretary; Capt. J. Penhall, general manager. Organized May 24, 1900, with capitalization £150,000, shares £1 par; issued, £136,366. Property is tin and copper mines at Redruth and Illogan, Cornwall, formerly making nearly 1,000 tons of copper yearly, but present annual production averages about 30,000 lbs. fine copper only, tin being the principal product.

CARNEY COPPER CO.

MICHIGAN.

Office: care of John O. Broden, president, Norway, Mich. Mine office: Carney, Menominee Co., Mich. Antoine Anheier, superintendent. Organized 1904, under laws of Michigan, with capitalization \$20,000. Has an 88' shaft, showing ore in bottom assaying 1.4% copper. Plans deepening shaft and exploring lands with a diamond drill, during 1906. **GEORGE E. CARNEY y OTRO.**

CHILE.

Own the Buena Vista mine, in the department of Tocopilla, Chile. Property, opened 1880, was idle at last accounts.

CAROLINA COPPER CO.

NORTH CAROLINA.

Office: Royal Oak, Mich. Mine office: Cullowhee, Jackson Co., N. C. Idle. Lewis C. Waldo, president; Thos. A. Cox, vice-president and superintendent; Hugh M. McCormick, secretary. Organized October 12, 1901, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Lands, 1,450 acres, showing 4 fissure veins, said to average 27' width, carrying estimated average values of 3% copper, 4 oz. silver and \$1 gold per ton, mainly from sulphide ores. Is opened by a 55' shaft and 200' tunnel. Property includes the old Wayehutte mine, and an undeveloped water power. Company hopes to resume work during 1906.

CAROLINA GOLD & COPPER CO.

NORTH CAROLINA

Office: Salisbury, N. C. Mine offices: New London, Stanley Co., N. C., and Gap Creek, Ashe Co., N. C. M. H. Caldwell, president; Edwin C. Gregorie, secretary; Richard Eames, Jr., treasurer and general manager. Organized circa 1900, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands, 350 acres, including the Parker mine, at New London, ores of which are reported by company to average 7% copper and \$5 gold per ton. Ores are sulphide, with quartz gangue. Has steam power and a 5-ton 5-stamp mill, employing 10 men, at last accounts.

CAROLINA KING MINING CO.

NORTH CAROLINA.

Mine office: Virgilina, Halifax Co., Va. Organized 1903, to take over property of the Copper World Mining Co., and the Danville & Virginia Copper Mining Co. The Copper World has two shafts, deepest 100', in a vein of fair width, showing chalcocite, also carbonate and oxide ores, assaying 15% to 65% copper.

CARP LAKE MINING CO.

MICHIGAN.

Office: care of H. L. Payne, general manager, Cleveland, Ohio. Lands, 1,087 acres. Work was begun in 1858, and the mine had a mill of 20 gravity stamps at one time. Mine is opened by shafts and adits, main adit 1,250'. Lode is about 7' wide, being a continuation of the Nonesuch lode, and carrying very rich streaks in sandstone. Fully described in Vol. II.

MINAS EL CARPIO.

SPAIN.

Mine office: Cortegana, Huelva, Spain. Area, 73 hectares. Mines have 11 old shafts. Ore is cupriferous pyrites. Idle.

CARR MINE & COLORADO CO., LTD.

COLORADO.

Voluntarily wound up, April, 1903.

SOCIEDAD ANONIMA MINAS DE CARRACEDO.**SPAIN.**

Office: Bilbao, Spain. Mine office: Vafes, Palencia, Spain. Property was undergoing development, in a leisurely manner, at last accounts.

CARRANZA-LAFONE COPPER MINING &**ARGENTINA.****SMELTING CORPORATION, LTD.**

Property sold, 1904, to Capillitas Copper Co., Ltd.

CARRERAS HERMANOS.**BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Mine is opened on two successive strata of cupriferous conglomerates. See article on Bolivia for details. Only native copper is mined, and the product, as barillas de cobre, is shipped through Mollendo, Perú, for refining. Employ 150 to 200 men. Annual output is equivalent to circa 600,000 lbs. fine copper.

CARRIE COPPER CO.**ARIZONA.**

Dead. Formerly held lands near Globe, Gila county, Arizona.

SOCIEDAD DE MINAS y FUNDICIONES DE CARRIZAL.**CHILE.**

Offices: 21, Ironmonger Lane, London, E. C., Eng., and Catedral 2489, Santiago de Chile. Mine office: Carrizal, Copiapó, Atacama, Chile. Samuel Gonzalez-Julio, chairman; Daniel Gonzalez-Julio, vice-chairman of Chilean board; Mark Clegg, chairman; Herbert J. Page, secretary, of London board; L. Tirapegui, secretary in Santiago; Wm. H. Martin, general manager. Organized June, 1898, under laws of Chile, with capitalization \$2,100,000, shares \$100 par. Dividends, 1898-1899, 22¾%; 1899-1900, 14%; 1900-1901, 6.5%; 1901-1902, 6.5%. Operations for fiscal year ending March 31, 1903, showed a loss of \$114,840. Lands, 4 groups, in various parts of the Carrizal district, province of Atacama, Chile, including the Chañarcitos mine, in the department of Freirina, opened 1857, which makes circa 1,800 tons of fine copper yearly; the Bronces, main shaft 408', opened 1881, at Jarillas Transito, Vallenar, Atacama; the Amarilla, main shaft 417', opened 1867, at Cerro Blanco, Chañarcillo, Copiapó; the Astillas, main shaft 260', opened 1878, in the Carrizal district, and the Armonia and Santa Margarita mines, of the famous Carrizal Alto group, at Carrizal Alto, Freirina, Atacama. Company has a 100-ton smelter, at Chañarcitos. The ores are dressed up to 12% to 15% copper, before taken to the smelter, and the product, a matte of 45% to 50% in tenor, is shipped to Wales, for refining.

CARRIZAL SHARE TRUST, LTD.**CHILE.**

Offices: 1, Laurence Pountney Hill, London, E. C., Eng. Owns stock in the Sociedad de Minas y Fundiciones de Carrizal.

CARRIZO COPPER CO.**MEXICO.**

Office: 711 Missouri Trust Bldg., St. Louis, Mo. Mine office: Autlán, Jalisco, Mexico. Employs 50 men. Col. Kent E. Keller, president and general manager; Whit. Gilbreath, vice-president; W. M. Fenwick, secretary and treasurer; E. E. Nicholson, general superintendent; George Lake, mine superintendent; Ramón Perez, smelter superintendent; Prof. H. A. Wheeler, consulting engineer. Organized December, 1905, under laws of Maine, with capitalization \$1,000,000, shares \$1 par. Annual meeting, third Saturday in March. On March 12, 1906, had \$12,000 cash on hand, and

was without accrued liabilities. Lands, 198 pertenencias, also a 500-acre millsite and 8,000 acres timber lands. Country rock is diorite, showing numerous fissure veins, of which 2 are being developed, principal ore body being reported by company to average 51' width and to be traceable for 1¾ miles. Mine is an antigua, discovered circa A. D. 1700, formerly worked for red oxides and native copper, which are shown at and near surface, with chalcocite and chalcopyrite at a little depth. Mine has a 200' tunnel, and 1,100' of mine openings, estimated to give 30,000 tons of ore blocked out for stoping, this averaging about 5% copper and 5 oz. silver per ton, with small gold values. Has a 25-h. p. hoist, good for 1,400', a 3-drill air-compressor, 30x36' carpenter shop, 30x36' smithy, machine-shop, sheds and 20 dwellings. Has an electric light plant, 600-lb. ice plant and maintains a school for workmen and children. Has 4 small adobe furnaces, and plans building a small modern smelter. Plans for underground development call for sinking a 500' shaft, and doing considerable crosscutting and drifting. Good ore bodies have been opened, and developments are satisfactory, but about a year will be required to prove the mine sufficiently for permanent equipment. Property is well managed and adequately financed, and seems to possess considerable merit.

CARTER COPPER CO.**VIRGINIA.**

Name changed, 1903, to Manassas-Gap Copper-Mines.

GUILLERMO CARVALLO.**CHILE.**

Operates the Fundicion Llallai mine, in the department of Quillota, Chile. Mine, opened 1900, makes matte equivalent to circa 500 tons fine copper yearly.

CASA GRANDE COPPER & GOLD MINING CO.**ARIZONA.**

Letters returned unclaimed from former office, Chicago, Ills., and former mine office, Casa Grande, Pinal Co., Arizona. Property was the Jack Rabbit mine, showing ore carrying gold and silver, with small copper values. Has steam power.

CASA GRANDE MINING & SMELTING CO.**ARIZONA.**

Office: 66 Broadway, New York. F. W. Pope, president; J. Douglas Taft, secretary; H. H. Douglass, treasurer. Organized June 14, 1902, under laws of Arizona, with capitalization \$5,000,000. Lands, 165 acres, 28 miles south of Casa Grande, Pinal Co., Arizona. Main shaft, 150'. A mere stock-jobbing device, put out, with aid of a lying prospectus, by that notorious gang of "mining" sharpers, Douglas, Lacey & Co.

CASCADE COPPER CO.**WASHINGTON.**

Said, in 1904, to be developing silver-lead ores, by tunnel, in the Horseshoe basin, Washington.

CASCADE COPPER MINING CO.**BRITISH COLUMBIA.**

Office: Victoria, B. C. Property is on Uchucklesit Harbour, Alberni division, Vancouver Island, British Columbia. Has an 8' chalcopyrite ore body, said to give average assays of 19.6% to 28.3% copper and about \$1.50 in gold and silver per ton. A shipment of 150 tons, to the Tacoma smelter, in 1904, gave net returns of \$22.40 per ton.

CASCADE COPPER MINING CO.**WYOMING.**

Letters returned unclaimed from former office, Chicago, Ill., and from former mine office, Encampment, Wyo. Was a twin of the Cataract Copper Mining Co.

CASCADES COPPER CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. John T. Baker, president; W. S. Russell, secretary. Capitalization \$1,250,000, shares \$1 par. Lands, 15 claims, including the Pasadena and High Five groups, circa 7 miles from Encampment, opened by a 100' shaft, showing a 20' vein, and a 900' tunnel, cutting two smaller veins.

CASCADIA MINING & DEVELOPMENT CO.**WASHINGTON.**

Succeeded, 1905, by Mt. St. Helens Consolidated Mining Co.

CASH MINE CO.**ARIZONA.**

Mine office: Groom Creek, Yavapai Co., Ariz. Harrington Blauvelt, general manager. Ores, carry gold, copper, silver and lead. Mine has 2 shafts, with steam power and a 10-stamp mill.

CASH MINING & MILLING CO.**COLORADO.**

Succeeded by American Queen Mining Co.

CASHIER GOLD & MINING & REDUCTION CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. B. L. Campbell, superintendent. Lands include the Brooklyn and adjoining claims, showing gold, silver and copper ores. Has steam power.

CASTELLANOS y CA.**CHILE.**

Operate a small mine, in the department of Combarbalá, Chile, producing about 75 tons of bars and matte yearly.

MINA CASTILLO DE BUTTRON.**SPAIN.**

Owned by Compañía del Ferrocarril y Minas del Buitron.

SOCIEDAD ESPAÑOLA MINAS DEL CASTILLO**SPAIN.****DE LAS GUARDAS.**

Office: Apartado 68, Bilbao, Spain. Mine office: Castillo de Las Guardas, Sevilla, Spain. Employs 387 men. Alfredo de Echevarria, chairman; Victoriano Galdís, vice-chairman; Eduardo Barandiaran, secretary; Francisco Trárraga, superintendent; Ramón de Urritia, engineer. Organized July 12, 1901, under laws of Spain, with capitalization 7,500,000 pesetas, shares 500 pesetas par. Lands 153.38 hectares. Property is in process of development. Company maintains a school for children. Is 23 kilometers from Zalamea La Real, and has a private railway of 15.5 kilometers, running from Castillo de Las Guardas to Ronquillo station, on the Ferrocarril Sevilla y Cala. Is a property of considerable promise, and is being developed systematically.

CASTLE DOME DEVELOPMENT CO.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Richard Roskelley, superintendent. Is sinking a 4x8' shaft.

CASTLE DOME EXPLORATION & REDUCTION CO.**ARIZONA.**

Office: care of B. L. Worthen, president, Tucson, Ariz. Chas. F.

Flack, secretary and treasurer; **Jas. H. Bennett**, general manager. Capitalization \$500,000, shares \$10 par. Lands, 17 claims, area 320 acres, 18 miles north of Gila City, Yuma county, Arizona, from which occasional small shipments have been made to smelters in San Francisco, during the past 25 years, these ranging from 37% to 52% copper; 50 oz. to 70 oz. silver and \$8 to \$20 gold per ton. Development is by 10 open-cuts, and shallow shafts, deepest only 80'. Property shows a wide mineral zone, carrying ore bodies in schist, with a porphyry contact to the north, and quartzite and limestone to the south. Presumably idle.

CASTREJON HERMANOS.**MEXICO.**

Own copper properties in the Huacana district, Ario, Michoacán, Mexico.

CASTRO-GRECIAN MINING CO.**UTAH.**

Letter returned unclaimed from alleged mine office, Bingham Canyon, Salt Lake Co., Utah. **J. P. Buzanes**, president; **L. C. Moore**, secretary and treasurer. Organized 1905, under laws of Utah, with capitalization \$1,500,000, shares \$1 par. Lands, sundry claims at Bingham, also miscellaneous claims in Carbon, Emery and Wasatch counties, Utah. Latter lands apparently sold, circa September, 1905, to Uintah Mining, Milling & Development Co., letter addressed to which company also has been returned, unclaimed.

CATALINA COPPER CO.**MEXICO.**

Office: Bisbee, Ariz. **T. J. Wyatt**, **J. M. Johnson** and **D. H. Hobbs**, directors. Organized February, 1904, with capitalization \$500,000, shares \$10 par. Lands are about 30 miles south of La Cananea, in the Arizpe district of Sonora, Mexico. Presumably idle.

CATALINA COPPER MINING CO.**ARIZONA.**

Dead. Fully described in Vol. V.

CATARACT COPPER MINING CO.**MONTANA.**

Office: 308 The Bourse, Philadelphia, Pa. Mine office: Cataract, Jefferson Co., Mont. **Carl S. Weidinger**, president; **Saml. B. Vrooman**, vice-president; **Marcus L. Hewett**, second vice-president and general manager; **Wilbur F. Middleton**, secretary; **J. L. Ketterlinus**, treasurer; **G. H. Bartlett**, mill superintendent; **J. Dwyer**, smelter superintendent. Organized 1901, under laws of South Dakota, with capitalization \$2,500,000, shares \$5 par.

Lands, 21 claims, area 425 acres, also 300 acres of placer claims, in the Cataract district, circa 12 miles from Basin and 30 miles from Butte—not a few miles, as claimed by the promoter. Company is supposed to hold 8 claims, under option. Lands include the Bullion, Buckeye, Gray Eagle, Cataract, Yellow Gambler, Timbuctoo and Goldbug properties. Principal development is on the Bullion mine, which is said to have upwards of 8,000' of workings. Development is by four tunnels. No. 1 tunnel, 235', is said to show a 4' to 8' vein. No. 2 tunnel, 200' vertically below No. 1, and 1,300' in length, is said to show a 10' to 14' vein, and has a 200 upraise at 900' from portal. No. 3 tunnel, 200' vertically below No. 2, is said to be 3,600' long, and not 5,000', as claimed in company's advertisement, and

shows a fissure vein, in granite, of 10' to 30' width, with paystreak averaging 5'. Gangue is altered granite, somewhat silicious, carrying iron pyrites and quartz, gold values being associated with the iron and quartz. No. 4 tunnel is 640' vertically below No. 3. Ore developed is claimed to average \$10 to \$12 per ton, and values are said to be largely in gold. Geological formation is claimed by company to be the same as in Butte. The Buckeye mine is said to show a 20' vein of concentrating ore, with a 4' paystreak of shipping ore. Equipment includes a 6-drill air-compressor and necessary mine buildings. The concentrator, of 150 tons nominal daily capacity, seems to have been built wrong, and has given no end of trouble, but in February, 1906, was running, reducing about 90 tons of crude ore to 40 tons of low-grade concentrates daily.

The company guaranteed to have a 300-ton smelter in blast July 1, 1903, and actually blew in a 275-ton smelter just one year later. This is a 44x144" Colorado Iron Works water-jacket blast-furnace, with blast heated to 800° F. in a "U" stove. Equipment includes a 150-h. p. engine, Connersville blower and a small electric plant. Smelter is very poorly located for economical receipt of fuel and fluxes. The company has been sued by the Colorado Iron Works on account of this plant.

The company is endeavoring to sell 115,000 shares of stock, at £1 each, in England, to provide funds for doubling the capacity of the concentrator and smelter, and figures on a profit of \$1,260,000 per annum therefrom, which shows that the statistical department of the company is much more capable than the operating department. Newspaper stories that J. Pierpont Morgan had invested \$60,000 in this property carry their own refutation. A trial run of 6,000 tons of ore, in 1905, gave a matte of 10% to 15% average tenor, with an average return of 2.29% copper, 18 oz. silver and \$7.60 gold per ton from the ore treated. The December, 1905, payroll, is said to have been \$17,000, and at end of the year the property was producing about 110 tons, from the Bullion mine, and shipping two cars of low grade concentrates daily. The promoter of this company, Marcus L. Hewett, is said to have made individual profits of \$75,000 from the sale of the company's stock—hence it would be unfair to call the mine unprofitable.

CATARACT COPPER MINING CO.

WYOMING.

Letters returned unclaimed from former office, Chicago, Ills., and former mine office, Encampment, Wyo. Was a twin of the Cascade Copper Mining Co.

SOCIÉTÉ DES MINES DE CUIVRE DE CATEMOU.

CHILE.

Offices: 50, Blvd. de la Senne, Brussels, Belgium, and 50, Blvd. Haussmann, Paris, France. Mine office: Nilgüe, Estacion Chagres, Putaendo, Chile. Achille Adam, president; Max Lyon, managing director; preceding officers: Georges de la Bouglise, Comte F. Balny d'Avricourt, Comte Hubert Delamarre, Auguste Collignon, Arthur L. Pearse, Eugene Renery and Georges Renery, directors; Guillaume Wouters, secretary; C. H. Macnutt, general manager; F. C. Vigeon, superintendent; J. R. Starkey, mill superintendent. Organized June 2, 1899, under laws of Belgium, with capitalization 5,000,000 francs,

shares 500 francs par, divided into 10,000 preference 8% shares, with an issue of 35,000 founders' shares, of no nominal value. Debentures, 2,500,000 francs authorized, at 5%; issued, 1, 070,000 francs. Annual meeting, last Friday in June.

Lands, 155 claims, with sundry miscellaneous tracts, held in fee and under government concessions, giving total landed holdings of about 30,000 acres, in the districts of Putaendo, Los Andes, Melipilla, La Ligua, Quillota and El Nilgüe, including the following mines: El Cobre de Melon, in the Quillota district, opened 1886; El Nilgüe mine, in the department of Putaendo, opened 1886; Las Maquinas de Catemú mine, in the department of Putaendo, opened 1870; Los Mantos mine, opened 1820; El Salado mine, opened 1841; La Esmeralda mine, opened 1860, and El Soldado mine, developed principally by tunnels. Country rocks are porphyry and trachyte, mainly the latter, showing contact and fissure veins, 40 different ore bodies of various kinds, sizes and promise being under development. Local management reports that ores carry an average of 6% copper, but a director states that the average will be only about 3.5% copper and 2 oz. silver per ton. Veins carry the usual oxide and carbonate ores near surface, and show chalcocite, bornite and chalcopyrite at comparatively slight depths. The mines were worked for many years by the old Chilean methods, but have been systematically developed, and are operated along modern lines, since taken over by the present company. Mine development is by tunnels, without steam-power equipment.

The reduction works, including mill and smelter, has a 450-h. p. steam plant. The 60-ton concentrator, completed 1904, is equipped with 7 Wilfley and Ferrari tables, 1 sampler and 1 slime table.

The smelter, distant 1 to 5 miles from the various mines, receives ore by carts, aerial trams and ground-trams. The smelter has been enlarged to 400 tons daily capacity, having two 75-ton rectangular water-jacket blast-furnaces and new blast-furnaces of 36x96" and 36x120", turning out 45% matte, which is reduced to blister copper in a converter having five 57x77" shells of the Copper Queen type. Final product is Chile bars carrying 99.7% copper and 32 oz. silver per ton. Fuel is bituminous coal, costing \$12.50 per ton, for the mines and concentrator, and coke, costing \$15 per ton, for the smelter, annual consumption being about 8,000 tons. Property is served by the Chilean state railway, 10 miles distant from the mines.

Production has been increased, from 935 metric tons in 1902, to 1,990 metric tons in 1904 and 2,450 metric tons in 1905. It is planned to increase the output to about 3,000 metric tons fine copper yearly. The management is good, and the properties are being developed along systematic and thoroughly sensible lines.

CAUCASUS COPPER CO., LTD.

RUSSIA.

Offices: 3, Bond Court House, Walbrook, London, E. C., Eng. Mine office: Dzanul, Kutais, Russia. A. A. Swan, chairman; H. H. Knox, consulting engineer; T. Breakell, general manager; John Tripp, secretary; W. R. Van Liew, works superintendent. Organized October 4, 1900, with capitalization £500,000, shares £1 par. Debentures, £500,000 authorized, at 6%; issued, £367,000.

Property is in six groups, known as the Dzansulski copper and silver-lead mines, in the Murgne Gorge, Artoin district, Government of Kutais, Russian Caucasus. Considerable development has been secured, and the company estimated, April, 1905, that the mines had in sight 3,600,000 tons of 3.1% copper ore, carrying small gold and silver values. Ore is chalcopyrite, with a silicious gangue, occurring in a mammoth lense of 50 metres to 150 metres width by about 300 metres length. The old works had a small smelter, increased by present owners to 300 tons daily capacity, but the ore slimes badly when concentrated, and is so high in silica and deficient in iron that heavy fluxing is necessary, in a district where fluxing ores are secured with difficulty. Smelting was suspended September, 1904, and a Wetherill magnetic separating plant installed, the new mill, with a daily capacity of 500 tons, being intended as the first unit of a 1,000-ton mill. Production was 1,946,360 lbs. fine copper in fiscal year 1904, and 511,920 lbs. fine copper in fiscal year 1905. Operations have been conducted under great difficulties, including apparently unnecessary restrictions from the Russian government, which have greatly hampered operations. Management is good, and the property, notwithstanding the drawbacks enumerated, is valuable, and likely to make a large and profitable mine eventually.

MINA DA CAVEIRA.**PORTUGAL.**

Mine office: care of Crookson & Hawkins, owners, Grandola, Portugal. Was in process of development, at last accounts.

CEDAR FOREST GOLD & COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Kingman, Mohave Co., Ariz. Organized August 27, 1903, under laws of Arizona, with capitalization \$600,000, shares \$1 par. Lands, 9 claims, area 180 acres, near headwaters of the Big Sandy river, claimed to show a 25' vein carrying gold and copper. Advertisements of company prove that its promoters either were dishonest, or else totally ignorant of copper mining.

CEDAR VALLEY GOLD & SILVER MINING CO.**ARIZONA.**

Mine office: Cedar, Mohave Co., Ariz. Philip P. Baker, superintendent. Lands include the Arnold, Silver Queen and other claims. Ores carry gold, silver and copper. Has steam power and a 15-stamp mill.

COMPAÑIA MINERA EL CEDRO.**MEXICO.**

Mine office: Guanajuato, Gto., Mexico. Vincente Gonzales, manager. Has steam power and is a producer of gold and copper, employing circa 50 men, at last accounts.

CENTENNIAL-BINGHAM MINING CO.**UTAH.**

Succeeded, 1904, by South Columbus Mining Co.

CENTENNIAL COPPER MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Mill office: Point Mills, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; preceding officers, John C. Watson, W. B. Mosman, Wm. Howell Reed and Stephen R. Dow, directors; John Pentecost, chief mining captain; G. S. Goodale, engineer; Alonzo Nicholas, chief clerk; Alex. G. Andrews, master mechanic. Organized 1896, under laws of Michigan, as successor of the Cen-

ennial Mining Co., with capitalization \$2,500,000, shares \$25 par; issued, \$2,250,000, with \$19.50 per share paid in. Last assessment was \$4, paid 1905, in two installments. Annual meeting, first Tuesday in April. Old Colony Trust Co., Boston, registrar.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1, 390, 228. 00
Entire amount invested in real estate.....	418, 295. 24
Amount of personal estate.....	353, 614. 47
Amount of floating debt.....	335, 894. 24
Amount due company.....	28, 637. 70

The floating debt includes \$300,000 in notes, due 1907, given for the Arcadian stamp-mill.

Lands, circa 670 acres, being Section 12, Town 56 North, Range 33 West, also a triangular patch of about 30 acres, at the southeastern corner of the main tract, bought to secure the outcrop of the Kearsarge lode, and including about 10 acres, bought of the old Colony, in 1905, for the surface plant. The first work was done, 1863, by the Schoolcraft Mining Co., which failed to open a paying mine, and was reorganized, 1876, as the Centennial Mining Co., and again reorganized, 1896, with present title. Expenditures of upwards of \$1,500,000 were made, mainly by the old companies, in unsuccessful efforts to open a paying mine on the northern extension of the Calumet conglomerate. Seven shafts, 3 of considerable depth, were sunk on this bed, No. 3, the deepest, being bottomed at 3,200'. Work on this lode was sufficiently extended to fully demonstrate the worthlessness of the Calumet conglomerate on the Centennial property. The Centennial lands are in the great mining camp of Calumet, and are available for building purposes. Two additions have been platted, and the lots sold at good prices. Only surface rights are sold, mineral being reserved by the company.

The present management wisely abandoned the conglomerate shafts in 1897, after a few months' efforts, and deepened two shallow shafts on the Osceola lode. These are 17x12' inside of timbers, sunk at an angle of 38°, and are 1,050' and 1,150' in depth, respectively. Upon securing the 20-acre tract carrying the outcrop of the Kearsarge lode, which underlies the Centennial's entire square mile of territory, the work of development was begun, September, 1899. Owing to the narrow width of the tract secured from the Osceola company, it was necessary to develop it in a peculiar manner, by two shafts, Nos. 1 and 2, which are but 90' apart at a surface, and continue parallel on the dip of the lode until the 13th level, when the Centennial's main tract is reached, after which No. 2 diverges from No. 1 at an angle of 15° on the plane of the lode, 300' being taken by a curve to secure the divergence of 15°. This plan of opening gives short drifts, until the shafts enter the main Centennial tract, after which length of openings is gained rapidly with depth. Each shaft is 7x18' inside of timbers, with three compartments, and sunk at an angle of 39° with the horizon. The overburden is about 100', and the amygdaloid averages about 16' width. Fair copper values were obtained in the first few levels, after

which a comparatively barren zone was penetrated, until the 14th level was reached, after which came gradual improvement. The 25th and levels below show excellent copper ground, with many good stopes. The mine had about 6 miles of underground openings, at the close of 1905, and is developing at the rate of about 8,000' per annum.

No. 1 shaft, 3,070' deep, Jan. 1, 1906, can be sunk 12,000' before reaching the Centennial's boundary. This shaft shows greatly improved ground below the 24th level, and also appears better in the north drifts of the upper levels. No. 1 has 5-ton skips, operated by a 32x72" duplex cylinder Nordberg hoist with double conical drum, good for a depth of 6,000'.

No. 2 shaft, 2,700' deep, Jan. 1, 1906, is fully opened to the 14th level, but for part of remaining depth is merely a winze, this having been made for both ventilation and safety. The shaft will be cut down to full working size, and timbered, during 1906. The temporary hoist will be replaced, in 1906, by the permanent winding engine, which is on the ground. The new engine is a 32x60" duplex cylinder Sullivan Corliss straight-face hoist with 2 drums of 14' diameter and 15' 6" winding face, grooved for 1½" wire cable. The hoist is fitted with devices to prevent over-winding, and is calculated to raise its maximum load of 5-ton skips at the rate of 4,000' per minute, operated under 150 lbs. steam pressure. New engine and compressor houses are to be built at No. 2 shaft, in 1906.

Owing to the juxtaposition of the shafts, rendered necessary by the peculiar conditions that gave the company merely a right-of-way into the main tract, but one rockhouse is required, this being at No. 1 shaft. This combination shaft-rockhouse is of wood frame, with corrugated iron sheathing, and has 3,000-ton rockbins. The rockhouse has 18x24" rock-crushers and is connected with No. 2 shafthouse, 90' distant, by trestle, with mechanical haulage for loaded and empty tram-cars.

The engine house is of stone, as is the 32x46' compressor-house, which has 35-drill Nordberg and 18-drill auxiliary air-compressors, and a Dean jet condenser in the basement. A new high-duty compressor will be added in 1906. The 54x58' boiler-house has four 125-h. p. Burt locomotive firebox boilers, and a 125' brick-lined self-supporting steel smokestack, of 7' diameter. A 16x46' frame pumphouse, with corrugated iron roof, has a fire-pump, fire-hose and hose-carts. The combination machine-shop and smithy is 50x108', with red-stone walls and steel truss roof, fitted with traveling cranes and a full complement of shop and blacksmithing tools, and has a railroad track running from end to end. The carpenter shop is 36x50' and the warehouse is 30x40' in size. A new office building is 30x40', and the miners' change-house is 25x50', with hot and cold waters, lockers, etc. The company also has a large number of substantial dwellings for employees, and the surface plant is one of the best, both in plan and equipment, to be found in a district where good plants are the rule. The mine is served by the Copper Range and Mineral Range railroads, connecting with the company's private rail line.

The old single-head mill, at the mine, having survived its usefulness, was dismantled, 1904, and the Arcadian mill, at Grosse Pointe, Portage Lake,

bought for \$296,000, with three years' time in which to pay for it. The 406-acre millsite has $1\frac{1}{4}$ miles water frontage, with ample room to waste all sands, and has a number of good dwellings for the use of the employees. The 132x124' steel mill has 3 Nordberg stamps, with foundations built for 3 more heads. There is a 15,000,000-gallon Nordberg pump, auxiliary machine-shop, smithy, etc. The foundations under the heads were in bad shape, and a new 12' concrete foundation was given one head, which was rebuilt and compounded, giving it a daily capacity of about 700 tons. A second single-stage head has been overhauled, and is crushing Centennial rock, the compound head being under lease to the Allouez. The third head is as yet in reserve. Crushing rolls have been installed to treat the oversize, adding materially to the mill's capacity, and a coopershop was built. 1905. The mill has a wharf, running 675' into deep water, and is fitted with modern coalhoists and a good coal-shed. The intake of the pump has been extended several hundred feet, into deeper water.

Production was begun July 5, 1904. The output of fine copper was 641,294 lbs. in 1904, and 1,446,584 lbs. in 1905. During 1905, about 20% of the rock rendered available by new openings was stoped, balance being added to the mines' reserves, and 18% of the rock broken was discarded. The 84,890 short tons crushed gave 2,069,490 lbs. mineral, which averaged 70% fine copper in the smelter, giving a net return of 17.4 lbs. fine copper per ton. While these returns are not what had been hoped for, they can be made to pay, if needs must, when the mine is extensively opened and production secured on a large scale, but the showing in the lower levels of the mine fully warrants the expectation of better average values at greater depth. Expenditures for 1905 were \$348,283.17, including \$47,899.34 laid out in new construction, and income from copper produced was \$230,129.48. The fact that but one-fifth of the ground opened was stoped partially explains this discrepancy between outgo and income. The Centennial has proven somewhat disappointing to date, but the management has displayed commendable courage and foresight in continuing underground development steadily and providing the surface equipment for a big mine. With better average stopes, such as are promised by the lowest levels yet opened, the figures of annual results should prove more satisfactory to shareholders.

CENTENNIAL-EUREKA MINING CO.

UTAH.

Offices: 50 Congress St., Boston, Mass., and 508 Dooly Bldg., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Wm. G. Sharpe, president; Alfred F. Holden, managing director; preceding officers, Wm. H. Coolidge, Robert D. Evans, Clarence A. Hight, J. J. Storrow and Sidney W. Winslow, directors; F. Winthrop Bachelder, secretary and treasurer; C. E. Allen, superintendent. Organized 1899, under laws of Maine, (as a reconstruction of an old company of the same name, organized 1876, under laws of Utah), with capitalization \$5,000,000, shares \$25 par; issued, \$2,500,000. National Shawmut Bank, Boston, registrar. Annual meeting, third Wednesday in April. This company and its predecessor paid dividends of \$2,750,000 to end of 1904; dividend November, 1904, was \$150,000. Control of company is owned by the United States Mining Co., which holds all but about 200 shares.

Lands are sundry claims in the Tintic district, near Eureka, including the Dove, Swan and Pelican groups, adjoining the original mine, bought circa January, 1906, which are considered promising. The mines are extensively developed and produce ore of two grades, the oxides and carbonates carrying high values in gold and silver and ranging \$10 to \$30 per ton in value. The low-grade deposits are of enormous extent, but carry only small values in gold and silver. Property was examined, early in 1905, by J. Parke Channing, a conservative and competent authority, who found reserves of 600,000 tons of ore, carrying average values of \$11.88 per ton. The East Fissure has upwards of 500,000 tons blocked out. Product is treated by the United States smelter, at West Jordan, though some ore was shipped, late in 1905, to the Mammoth smelter in California, both properties being controlled by the United States Mining Co. Employs 200 men.

CENTENNIAL MINE.**COLORADO.**

Office and mine: Georgetown, Clear Creek Co., Colo. David Kennedy, general manager; S. G. Evans, superintendent. Lands, circa 640 acres. Has cupriferous gold and silver ores in a 30" paystreak, opened 1903, assaying up to 24% copper, 5 oz. to 150 oz. silver and 3 oz. to 5 oz. gold per ton. Has steam power and employed about 20 men, at last accounts.

CENTRAL ALASKA GOLD & COPPER CO.**ALASKA.**

Office: care of Founders Trust Co., 403 State Life Bldg., Indianapolis, Ind. Was known formerly as Alaska Gold & Copper Co. Reorganized, circa 1905, under laws of Washington, with present title. Lands claimed are 28 placer claims, circa 220 miles north of Valdez, Alaska, on the Chistochina river. Company's advertising is very flamboyant, and especially unilluminating.

CENTRAL ARIZONA MINE.**ARIZONA.**

Mine office: Williams, Coconino Co., Ariz. Rounseville & Hardesty, owners; E. M. Hardesty, superintendent. Ores carry gold, silver and copper. Has gasoline power. Idle.

CENTRAL BLACK HILLS COPPER CO.**SOUTH DAKOTA.**

Office: 701 New England Bldg., Cleveland, Ohio. Mine office: Custer, Custer Co., S. D. E. M. Barnes, president and general manager; L. M. Chartrain, secretary; H. H. Francis, superintendent. Organized July, 1902, under laws of South Dakota, with capitalization \$1,500,000, shares \$1 par. Lands, 30 claims, area 600 acres, also a 40-acre millsite and miscellaneous lands giving total holdings of 720 acres, in the Pennington district, showing sundry veins, of which two, of 18' average width, opened by shafts of 85' and 110', and by tunnels of 42' and 225', are contacts between slate and quartzite, giving average assays of 6% copper, 2 oz. silver and \$4 to \$200 gold per ton, from malachite, azurite and chalcopyrite. Ore is expected by company to average about 3% copper in actual treatment. Has a 200-h. p. steam plant and power drills, concentrator with 2 crushers and 4 jigs, and a 100-ton leaching plant, planned to turn out cement copper. Also has a sawmill. Property shows large bodies of low-grade ore that gives promise of successful treatment by lixiviation, but present management does not seem equal to the task of development.

CENTRAL CHILI COPPER CO., LTD.**CHILE.**

Offices: 15, Angel Court, London, E. C., Eng. Mine office: Panulcillo, Ovalle, Coquimbo, Chile. Employs 350 men. Eugene A. J. Goldschmid, chairman; Bertrand C. Hinman, managing director; Harris K. Masters, general manager; Henry B. Greenwood, secretary. Organized Jan. 10, 1898, as a second reconstruction of the Panulcillo Copper Co., Ltd., with capitalization increased, November, 1905, to £400,000, shares £1 par; issued, £306,248. Debentures outstanding, £16,798, at 4%.

This company and its predecessors have worked the Panulcillo mine since 1894. Group includes the Panulcillo and San Gregorio, at Panulcillo, and the Inagotable, Cocinera and Condesa mines at Huamalota Sataqui, Ovalle. Mines, except the Panulcillo, are small. Ores produced are malachite, azurite, chalcocite and chalcopyrite. The increase in capitalization was made for the purpose of developing the Cocinera group of four mines, which are said to show nearly 2,000,000 long tons of ore. Ores of the other mines range 3% to 7% in copper tenor.

The 200-ton smelter is connected with the Panulcillo mine by tramway, and the product is matte, shipped to New York for refining, but a converter plant is to be erected. Production, 1905, was 4,593 480 lbs. fine copper. The property is one of considerable value, and its future prospects seem much improved.

CENTRAL GOLD & COPPER CO.**NEW MEXICO.**

Letter returned unclaimed from former mine office, Mineral Hill, N. M.

LA GRAN FUNDICION CENTRAL MEXICANA.**MEXICO.**

Office and works: Aguascalientes, Aguascalientes, Mexico. Is owned and operated by the American Smelting & Refining Co.

CENTRAL MINING CO.**MICHIGAN.**

Wound up, 1905 and lands sold to Calumet & Hecla Mining Co., for \$160,000. Was long a considerable producer, and paid dividends of \$2,030,000.

CENTRE STAR CONSOLIDATED MINING CO.**BRITISH COLUMBIA.**

Mine office: Rossland, Yale district, B. C. Employs 350 men. E. B. Kirby, manager. Organized January, 1906, as successor of the Centre Star Mining Co., and is controlled by the Consolidated Mining & Smelting Company of Canada. The Centre Star Mining Co. paid \$210,000 dividends, 1895-1904. Mine is extensively developed, but high-grade ores of upper workings were nearly exhausted at the end of 1905, leaving large low-grade ore bodies. Diamond drilling has shown a continuance of the higher-grade ore lost on the 8th level, and this ore body is to be opened. Mine is connected with the War Eagle mine on the 9th level. Mine is to be equipped with a new hoist, of great capacity, and plans shipping large quantities of low-grade ore, to the Trail smelter. For 1904, production was 77,892 tons ore, averaging 0.72 % copper, 0.35 oz. silver and 0.36 oz. gold per ton, giving an average of \$7.75 per ton, gross smelter values. Mining costs, for fiscal year 1903, were only \$1.97 per ton.

CENTRE STAR MINING CO., LTD.**BRITISH COLUMBIA.**

Succeeded, January, 1906, by Centre Star Consolidated Mining Co.

CENTURY MINE.**ONTARIO.**

Office: care of Foster & Black, Sudbury, Ont. Lands are in Graham Twp.,

Algoma, Ontario, showing ores giving assays of 7% to 13% copper, and from a trace to \$26 gold per ton.

CERESIER MINE.

FRANCE.

Once was the principal copper producer of France. Idle many years.

CERMA DEVELOPMENT CO.

ARIZONA.

Office: Calumet, Mich. Organized, 1903, to develop a group of 47 claims in the Huachuca Mountains, Cochise county, Arizona. Idle.

CERRO COPPER CO., LTD.

PERÚ.

Offices: 21, Ironmonger Lane, London, E. C., Eng. H. J. Page, secretary. Organized Oct. 27, 1900, with capitalization £101,000, shares £1 par: issued, £16,416. Has abandoned property formerly held in the Cerro de Pasco district of Perú.

SOCIEDAD CERRO DE PASCO.

PERÚ.

Supposed to be Peruvian title of the Cerro de Pasco Mining Co.

CERRO DE PASCO INVESTMENT CO.

PERÚ.

Office: 5-15 Broad St., New York. Jas. B. Haggin, president. Has some occult connection with the Cerro de Pasco Mining Co.

CERRO DE PASCO MINING CO.

PERÚ.

Office: 5-15 Broad St., New York. Peruvian general office: Lima, Perú. Mine office: Cerro de Pasco, Junin, Perú. Works office: Tinahuarco, Junin, Perú. Railroad office: Oroya, Perú. Mine is owned by Jas. B. Haggin, J. Pierpont Morgan, H. Mck. Twombly, and other wealthy residents of New York. President is a figurehead, changed occasionally, Jas. B. Haggin being president to all practical intents and purposes; H. Esk Moller, secretary; Alfred W. McCune, general manager; Frank Klepetko, consulting engineer; C. H. Repath, assistant consulting engineer; A. A. Abbott, mine superintendent; W. F. Blackford, engineer; John J. Case, smelter superintendent. Organized June 6, 1902, under laws of New Jersey, with capitalization \$10,000,000. Has some connection financially with the Cerro de Pasco Investment Co., which presumably has been put up as a shield, to guard the mining company from the devious attacks of grafters, both Peruvian and domestic.

Lands, circa one square mile, including about three-fourths of the rich Cerro de Pasco district, said to have been bought at a cost of about \$2,650,000. Company is also said to have bought copper claims in the Yauli and Morococha districts of Perú. Miscellaneous lands include a smelter-site, and extensive coal tracts north of Cerro de Pasco.

The Cerro de Pasco district is located 14,300' above sea-level, rendering physical labor very fatiguing. The population of the town is variously estimated at 5,000 to 20,000. The surrounding country is bleak, and all food and supplies must be brought in from considerable distances. The year is divided into two periods, the wet and dry, the wet season being from November to April. The summers are not hot, owing to the great altitude, and the winters are not cold, owing to the low latitude. Snow and hail fall at any time, summer or winter, but rarely remain on the ground as long as 48 hours, even in winter. The fluctuation between mean summer and winter temperatures is about 20° Fahrenheit, only.

Silver was discovered at Cerro de Pasco in 1630, and the production of the district, to the close of the Nineteenth Century, is estimated at 450,000,000 ounces, secured from about 40,000,000 tons of silver and copper ore, nearly all extracted by hand labor, and carried 3 to 6 miles on the backs of llamas, to primitive smelters, whence the silver bullion was transported by llamas 200 miles to Lima, until circa 1870, when the railroad was completed to Oroya.

Authorities disagree hopelessly as to the geology of the district. All that can be said with certainty is, that in an area approximately one mile wide and between one and two miles in length, there is ore on nearly every claim, proving the Cerro de Pasco one of the richest mineral deposits of the globe. The ores carry gold, silver, copper, cobalt and other metals, values being found in two zones, the upper carrying mainly silver, in quantities from a few ounces to thousands of ounces per ton, in decomposed quartz. Considerable gold is found in the upper zone, this running as high as 1 oz. to 2 oz. per ton, occurring in rich but erratic chutes. The silver values usually extend to about 100' depth, followed by silver-copper ores, and they, in turn, at a little greater depth, by copper-silver ores. All of the copper ores are more or less argentiferous, being estimated to average 15 oz. to 35 oz. silver per ton, and practically all of the copper ore is bismuthiferous also, hence highly refractory in reduction. In the past only the richest copper ores have been worked, those shipped ranging from 25% to 40% in tenor. Claims advanced that the ores of the district, will average 25% copper are entirely unwarranted, as the high-grade ore shipped was carefully hand-selected, owing to excessive transportation charges. The copper ores grow leaner with depth, as in other districts, below the permanent water level, at about 250'. In but few cases have any of the old mines been opened to depths of more than 200', while the great majority are less than 100' in depth.

The lands owned by the company at Cerro de Pasco are in a compact tract, lying in a basin, hence tunneling is impracticable, unless a very long tunnel be driven. There are but three attempts of this sort, the only one of importance being the Rumaillana tunnel, begun 1887, by Henry Meiggs, and discontinued, because of his death, at a distance of 1,000'. Meiggs held a concession from the Peruvian government for 25% of the gross values extracted by mines drained through this tunnel. This concession is now held by a company, which has cleaned out the old heading and driven the tunnel to length of 1,466'. There is a possibility of litigation between the Cerro de Pasco and this corporation, in case the latter completes the tunnel. The surface of the Cerro de Pasco tract shows many "tajos," big pits resulting from the caving-in of old open-cast workings.

The old mine workings, hundreds in number, have been disregarded, except as throwing light upon the geology and ore values of the property, and development of the present company is by five two-compartment shafts, modern pumps permitting the driving of mine openings below the water-level, and a modern metallurgical plant allowing the reduction of base ores that formerly were hopelessly unprofitable. Development has been pushed vigorously and methodically, the principal mines being known as the Diamante and Del Norte. Ore in sight is variously estimated at 2,000,000 to 75,000,000 tons, the latter

figure representing the possibility, rather than being an estimate based upon tangible data. That the ore bodies carry tens of millions of tons is a reasonable deduction from the developments of the olden days, supplemented by the work of the present company. Various new ore bodies have been opened, and several years' reserves have been blocked out. The ore in the new workings is divided into 3 grades, the first grade averaging 8% to 10% copper, with good silver values regularly, and high values frequently. Second-grade ore carries about 6% copper, with fair silver values, and the average copper tenor of the third grade is uncertain, but probably workable.

In addition to the regular mining work, considerable prospecting is in progress, on the main tract, and also in the adjoining districts of Vincuscancha, Quishuarcancha and Goyllarisquisca. As the diamond drill is used extensively for borings, it is to be hoped that the formation in these districts is not as hard as the names.

The smelter, at Tinahuarco, is 9 miles from the mines and connected therewith by rail. The smelter is designed as the first unit of a mammoth reduction plant, planned to be doubled, and possibly quadrupled, at later date. The furnaces have mechanical charge and the plant is automatic throughout, so far as possible, with the dual object of saving costs and rendering the works as little dependent as possible upon the ignorant native workmen, who must be employed for manual labor. There are four 56x180" Allis-Chalmers water-jacket blast-furnaces, of which three are in place and the fourth is on the ground for installation. These are rated by management at only 250 tonseach, but should give a higher duty. The blast is furnished by 3 No. 11 Connorsville blowers, delivering air at 40 oz. pressure. The converter department has 4 stands, with room for a fifth, blast being furnished by two 1,500-h. p. Nordberg air-compressors, each rated at a duty of 24,000 cubic feet of free air per minute, compressed to 17 lbs. pressure per square inch. For general power purposes there are two 475-h. p. Nordberg engines, direct-connected to two 350-kw. electric generators. Steam is supplied by Babcock & Wilcox boilers, of 4,000 aggregate horse power.

Ores are smelted raw, with charges of 5% to 10% limestone and 12% coke. The first furnace went into commission Jan. 7, 1906, and the second and third stacks were blown in during February. The fourth and last furnace was expected to be blown in about May, 1906. The beginning made was not an unalloyed success, the furnaces freezing up repeatedly. The altitude of 14,000', at which the smelter is working, may have had some effect, but a more probable cause is at hand in the inefficiency of the native labor employed at the smelter. It is probable that the preliminary troubles will be settled in a comparatively short time.

Coal mines owned by the company have been developed at Vincuscancha, 17 miles from Cerro de Pasco, and are connected with the mine and smelter by rail. The coal is bituminous and cokes fairly well. A washery is to be built at the mines, and a coking plant with 72 beehive ovens is being built at the smelter. Pending the utilization of its own fuel, the company is burning Australian coal at the mines, and English coke in the smelter.

The mine is served by the Cerro de Pasco railway, built by the Cerro de Pasco Railway Co., closely affiliated with the Cerro de Pasco Mining Co., under a government concession. This line runs about 80 miles from Cerro de Pasco southward to Oroya, and 17 miles northward to the company's coal mines. Including the main line, spurs and sidings, it will have circa 125 miles of track. The company is said also to have under consideration the extension of this line past the coal mines, through a very rugged country said to be rich in copper and silver. The line has an average grade of 1.5%, with a maximum grade of 3%, and has cost upwards of \$2,000,000. At Oroya connection is made with the Central Railway of Perú, running 130 miles to Callao. In this distance the line, which cost \$43,000,000, gains nearly 3 miles vertical elevation, reaching the highest altitude of any railroad on the globe, after surmounting almost incredible obstacles, having an average grade of 2.5% and passing through no less than 57 tunnels, including the Galera tunnel of one kilometer length, which cuts through a ridge of the Andes. Despite its high average grade, it has been necessary to build many switchbacks.

Wages are \$2.50 to \$4 per day for white labor, and 25 cents to 50 cents per day for natives. The latter are tractable and for some purposes fairly efficient. The company employs about 6,000 men, of whom 100 are Americans and Britons, the balance being natives.

The Cerro de Pasco probably is the most expensive copper proposition ever developed. Other mines have expended more money but most of it came from earnings, while the Cerro de Pasco mines, smelter and railroad have cost probably between \$10,000,000 and \$12,000,000, to the point of production, and much work remains for the future. The policy of the mine is one of expansion, and as the management is experienced and capable, as well as of great financial strength, it seems probable that the smelting troubles will be overcome, as the other difficulties have been in the past, and that the Cerro de Pasco, which should be a considerable producer during 1906, will become, eventually, one of the world's largest copper mines.

CERRO DE PASCO TUNNEL & MINING CO.

PERÚ.

Office: 45 Wall St., New York. Eleanor Rawles-Reader, president and secretary; C. A. Neville, vice-president; H. N. Carter, treasurer. Organized August 8, 1902, under laws of Maine, with capitalization \$12,000,000, shares \$10 par, half in 7% cumulative preferred, and half in common stock. Lands, 196 hectares, about half in the Yauli district and half in the Acari district, latter 37 miles from Lomas. Is supposed also to have, or to have had, an option on the Rumallana or Meiggs tunnel, in the Cerro de Pasco district. Was promoted by Eleanor Rawles-Reader, a lady-financier who obtains much notoriety in the press, which expatiates lovingly upon her beauty and magnetic temperament, and bears down lightly upon the question of the success—or otherwise—of her various promotions.

CERRO MURIANO MINES, LTD.

SPAIN.

Offices: 5, Queen Street Place, London, E. C., Eng. Mine office: Manriques 9, Córdoba, Spain. Employs 160 men. Wm. Frecheville, chairman: John Taylor & Sons, managers; F. H. Williams, secretary; Richard E. Carr,

British vice-consul at Córdoba, agent; Joseph Tamblyn, mining captain. Organized May 7, 1903, and capitalization increased, 1905, to £235,000, shares £1 par; issued, £143,220.

Lands, 314 hectares, area 776 acres, in the districts of Córdoba and Obejo, held under perpetual lease from the State, also sundry leasehold tracts. Property shows sundry old mines, which were worked during the era of Roman domination, to a depth of at least 400', notwithstanding their wetness. Property shows 6 large and several small fissure veins in micaceous schists, diorite and quartzite, carrying chalcopyrite and iron pyrites, with a gangue of calcite, quartz, clay and country rock. Veins have widths of 1' to 40', with following lengths: Calavera, 1,635'; Excelsior, 635'; Lorenzo, 4,575'; Isabel, 5,550'; Cerro Muriano, 8,500'. Ore taken from old Roman workings has assayed 28% to 34% copper.

Main shafts are the Santa Victoria and San Rafael, 300 metres apart. The San Rafael is 917' deep and very wet. Crosscuts have been driven at depths of 100, 132, and 154 metres, each level showing a vein of 5 to 13 metres width, with the better portions worked out by the Romans. The San Rafael shaft has been enlarged and is the main pumping shaft, equipped with a Hawthorne-Davey Cornish pump having a 54" high-pressure cylinder with 96" stroke, and a 94" low-pressure cylinder, with 16" stroke. The pump is calculated to operate to a depth of 1,580', and is giving excellent results. The San Rafael is drifting on the 820' level and is said to have ore of fair grade thereon.

The Santa Victoria shaft is bottomed in the footwall at 726', and is drifting on the 706' level. The San Guillermo shaft suspended sinking at 42'.

Surface equipment includes 3 steam hoists and a 10-drill Walker air-compressor. The Ferrocarril Andaluces passes over the property, and a railway station has been built near the San Rafael shaft. Credit for the reopening of this old property belongs to Mr. Carr. The developments are of a favorable nature, and at the end of 1905 the mine had about 25,000 tons of 4% ore blocked out. This is one of the largest and most interesting of the old Hispano-Roman mines, and was famous, before the Christian era, for the high quality of copper and brass produced from its ores, but was entirely idle for some 2,000 years, until reopened by the present owners.

COMPAÑIA MINERA CERRO VERDE, S. A.

MEXICO.

Is the Mexican corporation of the San Xavier Copper Co.

SUCESION CERVERO.

CHILE.

Office and mine: Petorca, Aconcagua, Chile. Operates the Cabildo mine, opened 1886, producing the equivalent of 800 tons fine copper yearly, shipped as matte. Also owns the following old mines, at Nipa and Coligue; Montoya, opened 1855, developed by a 900' tunnel; Castillo, opened by a 400' shaft; Quisco, opened by a 300' shaft, and Cuevas, opened by a 120' shaft. Employed about 250 men, at last accounts.

CETINI MINE.

ITALY.

A comparatively new mine, near Pisa, in the Volterrano district of Italy, with occurrence and nature of ore similar to the Montecatini. Is a small producer of copper.

CHAFFEE GOLD & COPPER MINING CO. COLORADO & WYOMING.

Mine office: Black Hawk, Gilpin Co., Colo. S. N. Cravens, president; G. W. Doverspike, vice-president; H. R. McClellan, secretary and treasurer. Organized September, 1901, with capitalization \$100,000, shares 10 cents par. Is out of debt, but without funds. Lands, 5 acres, known as the Telephone claim, $1\frac{1}{4}$ miles from Black Hawk, opened by a 100' tunnel, said to show a 6' vein. Also has 80 acres, undeveloped, near Tie Siding, Albany county, Wyoming.

CHALCHIHUITES MINES CO. MEXICO.

Office: 288 Garside St., Newark, N. J. Mine office: Chalchihuites, Zacatecas, Mexico. Edw. H. Jones, president; C. C. Hamer, secretary; B. W. Farris, general manager. Lands, 192 pertenencias, including the San Nicolás mine, carrying ores of gold, silver, copper and lead. Is opened by shaft and equipped with steam power, employing about 40 men at last accounts.

CHALLENGE MINE. MICHIGAN.

Owned by Mary's Mineral Land Co.

CHAMPION COPPER CO. MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Mill office: Redridge, Houghton Co., Mich. Employs circa 900 men. Wm. A. Paine, president; Arthur G. Stanwood, vice-president; preceding officers, Samuel L. Smith, Chas. H. Paine, Geo. P. Gardner, Richard Olney and Nathaniel H. Stone, directors; Frederic Stanwood, secretary and treasurer; F. W. Denton, general manager; John Jolly, underground superintendent; Richard Trevarrow, mining captain; F. G. Coggin, mill superintendent; R. H. Leach, assistant mill superintendent; M. J. Harrington, chief clerk; H. F. Mercer, chief engineer; W. E. Campbell, master mechanic; Mark Cunningham, superintendent of motive power. Organized December, 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Entire stock issue is owned jointly by the Copper Range Consolidated Co. and St. Mary's Mineral Land Co. The Champion Copper Co. owns \$44,000 stock of the Michigan Smelting Co. Dividends were \$300,000, in 1903; \$200,000 in 1904 and \$1,000,000 in 1905. The company earned, 1905, over all expenditures, \$976,770.87, and closed the year with a cash surplus of \$140,526.

Lands, 1,240 acres, consisting of the south half of Section 30; west half and north half of northeast quarter and southwest quarter of northeast quarter of Section 31, Town 54 North, Range 34 West; southeast quarter of Section 25 and east half of Section 36, Town 54 North, Range 35 West, practically all on the mineral belt. Neighbors of the Champion are the Copper Range and Trimountain on the north, lands of St. Mary's company and Hussey, Howe & Co. on the east; Hussey-Howe lands and the Globe property on the south, and the Copper Range tract on the west. The tract gives a distance of 9,047' on the strike of the lode, and at the present angle of dip, the deepest shaft could go down 18,950', before reaching the company's boundary line on the west.

Development was begun in 1899, under direction of Dr. L. L. Hubbard, and three parallel amygdaloids were uncovered by trenching, one of which, the Baltic lode, showed phenomenal copper values. The two amygdaloids paralleling

the Baltic lode show copper in sufficient quantities to render their future exploration advisable. A fourth amygdaloid, about 15' wide, discovered 1901, east of the Baltic lode, carries heavy copper to a promising extent, and there also is a fissure vein of arsenical ore, apparently algodonite, near "C" shaft. The width of this vein at surface is slight, and mineral contents variable, but on the second level the fissure is 2' wide and well mineralized.

The dip of the Baltic lode at the Champion is about 70°, with about the same strike as at the Trimountain, rather than the exaggerated easterly trend noted at the Baltic mine. The bed runs 13' to 45' and averages 24' width, carrying more epidote than at the Trimountain and Baltic. The surface of the tract is very hilly, but the overburden is less than is found either to the northward or southward. The stretches of lean ground in the mine are few, and the lode carries heavy copper in profusion, mostly in barrel size, but running up to masses of 10 tons in weight.

The mine is developed by 4 shafts, numbered from north to south, with room for 4 shafts.

"A" is merely the site of a possible future shaft.

"B" shaft, the northermost, is 1,835' south of the Trimountain boundary, with collar 635' above mean water datum of Lake Superior, and at the close of 1905 was 1,040' deep.

"C" shaft is 1,050' south of "B," 616' above the lake, and 1,000' deep.

"D" shaft is 1,300' south of "C," 621' above the lake, and 1,105' deep.

"E" shaft is 1,300' south of "D," 3,900' north of the Globe boundary, and is 1,104' deep.

"F" shaft, 1,300' south of "E," was abandoned, because of the treacherous overburden.

All four shafts were deepened during 1905, and are connected on the upper levels. The mine has about 7 miles of lateral openings. The Baltic lode shows so little poor ground in the Champion mine that it is probable that eventually nearly every level will be opened from end to end of the mine, giving the longest average levels opened in any Lake Superior property, if not in the world. The only really poor ground shown in the mine was at "E" shaft, in the second and third levels, but the mineralization is regular and satisfactory below the fourth level. The mine shows some stopes that are phenomenal for width and richness.

The shafts have duplicate combination 40x50' rockhouses, each equipped with a steam-hammer for heavy copper, one 12x15" and two 18x24" crushers, engines and storage-bins, "D" shaft having one extra 18x24" crusher. The old equipment included hoists at each shaft good for 1,500' depth. The permanent equipment was placed at "D" shaft in 1905, this including a Nordberg hoist having 24x60" duplex cylinders and double conical drum with maximum diameter of 14' and capacity for two 3,000' cables. The engine-house at "D" shaft is of mine rock, with redstone trimming, and the boiler-house adjoining has a battery of Burt locomotive firebox boilers. A new coal-trestle, entirely enclosed, was built at "D" shaft in 1905. "E" shaft is to have a permanent hoist in 1906, which will be a duplicate of the one at "D" shaft.

The principal mine buildings are located about a quarter mile south of "E"

shaft. A ravine has been dammed, impounding about 12,000,000 gallons of water for boilers, the dam being 30' from hardpan foundation to crest, with a cement core 5' at the bottom and 2' at the top, reinforced by rock. The machine-shop, 60x144', of sandstone with slate roof, has a traveling crane and trolley-rail for its entire length, and is equipped with a complete line of shop tools, power being supplied by a 30-h. p. electric motor. Standing beside the machine-shop, and also of red sandstone, is the 50x128' smithy, which has a trolley rail for handling forgings, running the entire length of the shop. Both machine-shop and smithy have railroad tracks connecting with the Copper Range road. The carpenter-shop, of wood, with iron roof and siding, is 32x60' in size.

The main compressor building, at "F" shaft, is of steel, housing a 100-drill Nordberg quadruple expansion two-stage air-compressor, with capacity to compress 9,120 cubic feet of free air per minute to a pressure of 70 lbs per inch. The compressor, operates at a steam pressure of 280 lbs. and has a regenerative feed-water system. Power is furnished by three 250-h. p. Geary water-tube boilers. At "B" shaft is a 40-drill Ingersoll-Sergeant cross-compound two-stage air-compressor, with vertical receiver intercooler. The electric light plant, with a 100-kw. generator, is in the main compressor building. The power plant at "F" shaft has 3 Bradley boilers, operated at 250 lbs. steam pressure, and a coal-bunker with railroad tracks on trestles, having a tunnel below each trestle, coal being drawn, as required, through hatches into hopper-cars in the tunnel, these passing over an inclined track into the boiler-house, saving much labor in the handling of fuel. There is an automatic telephone system, with 30 stations, connecting the principal buildings and a number of pump-stations underground. Annual coal consumption, at mine and mill, is about 20,000 tons.

The company owns a good office building, two miners' changing houses, warehouses, stables, three large boarding-houses and 244 substantial dwellings. The attractive townsite is called Painsedale, and in addition to the company's buildings has a hotel, schoolhouse and several business houses. The Sarah Sargeant Paine memorial library, a handsome red sandstone structure costing \$30,000, was erected by Wm. A. Paine, president of the company, as a memorial to his mother, and is much appreciated by the company's employees. The water system, serving the mine and town jointly, has a 1,000,000-gallon electric pump at Lake Perreault, 4½ miles distant, and a 200,000-gallon steel stand-pipe on high ground near the mine.

The stamp-mill, at Freda, on Lake Superior, about two miles west of Redridge, is 215x266', of steel and concrete, built by the Wisconsin Bridge & Iron Co. The original mill has 4 Nordberg stamps, each with a 15' concrete foundation, and an addition of 88x215', completed 1905, is used for new crushing machinery. The mill has cement floors in the wash-room. The wash for the four heads has Hodge graduated adjustable-speed jigs, with plungers working simultaneously or alternately, in pairs, also 40 Overstrom tables. The addition has space for two stamps, with washing machinery, and is occupied by an experimental unit, that employs crushers instead of stamps. Rock is fed automatically from bins to a gyratory crusher, passing over a belt-conveyor, whence barrel copper is hand-picked. The

rock passes thence to very large jigs, with sieves made of punched steel. Material from the first jigs passes through successive sets of rolls and jigs, each reducing the material in size, and each constituting a complete concentrating unit. The advantage of this system is the extraction of copper without unnecessary pounding under the stamps, and the extraction of the heavier copper in the earlier stages of jigging. The copper is secured in rough form, showing "horns," as in the mine, whereas the heavier copper from the stampheads emerges as rounded pebbles. The new crushing plant obviates considerable of the heavy sliming inseparable from the use of steam stamps. Losses under the old plan of milling slightly exceed 0.3%, and the new crushing plant shows a loss of less than 0.3%. A Hancock jig is to be installed, in 1906, for experimental purposes.

In the older mill, all heads were cross-compounded June, 1903, but the experiment did not prove a success commercially, although theoretically it was a considerable step in advance. Could all four stamps be operated simultaneously and regularly, the cross-compounding doubtless would effect a saving in fuel costs, but in ordinary practice it has been found preferable to have each stamping unit independent. Regrinding of raggings is done by Allis-Chalmers crushing rolls, having one roll in a fixed bearing and the other with a spring adjustment. The preliminary discharge from the stampheads is treated on very large jigs having 30x48" sieves of punched steel, with one-eighth inch openings, installed in connection with the head. Each head has two settling tanks, the first 8x8' and 3' deep, with "V" bottom, connected by a fan-shaped apron with the second tank, 16x16' with a "W" bottom. Velocity of flow of slimes is 10' per second in the first, and only 1' per second in the last tank. Pulp is withdrawn through spigots at the bottom of each tank.

The mill is heated by hot water from a Green fuel economizer, piped at 300° to 350° F. to a steel-clad chamber, whence heated air is drawn into ducts by a Sturtevant blower and distributed through the mills, the water being pumped back to the economizers and thence fed again to the boilers.

The steel boiler-house, remodeled 1905, has four 200-h. p. Stirling boilers and 5 Dutch oven Scotch marine boilers, latter maintained in reserve. Automatic stokers were tried, but have been discarded. Coal is brought to the boilers by gravity-tram and reduced to uniform size by a grinder before feeding to the grates, and ashes are washed into the lake through a launder, by jets of water. Exhaust steam passes through dry condensers, thence to a hot-well, from which water is fed to the boilers at a high temperature.

A 20,000,000-gallon Nordberg triple expansion pump is housed in a 40x60' steel pumphouse, with truss roof and traveling crane. Water for the mill and boilers comes from the lake, through a 1,020' tunnel, the shore end having a well with bottom 8' lower than the lake level, this being the longest tunnel ever driven under Lake Superior. The intake crib has a free area of 45 square feet, and with a second crib the tunnel could furnish water for 8 to 10 stamps, Water cost is less than 1½ cents per ton of rock stamped.

The warehouse, office and laboratory at the mill were burned August 16,

1905, but have been replaced. The milling plant has machine, carpenter and blacksmith shops, a fire-pump and water mains, with a five hydrants, a private telephone system and about 20 dwellings for employees.

At the close of 1905, rock production was approximately 2,000 tons daily and is to be increased. Only about 15% of the lode rock broken in the mine is discarded. In 1905 the mill stamped 604,483 short tons of rock, producing therefrom 22,651,541 lbs. mineral, from which was smelted 15,707,426 lbs. fine copper, giving an average yield of 25.98 lbs. fine copper per ton. Total cost of fine copper, including construction account, was 9.34 cents per pound.

The Champion is one of the largest and richest of the Lake Superior mines and has been admirably handled from the beginning. Among the amygdaloid mines of the district the Champion is second only to the Quincy in production, and second only to the Wolverine in richness. The mine has by no means reached its ultimate limit of output, and should show a steady increase in production for some years to come, with bright prospects of becoming the largest and most profitable amygdaloid mine of the district.

CHAMPION GOLD & COPPER MINING CO.

Office: California Blk., Tacoma, Wash.

CHAMPION COPPER MINING CO.

IDAHO.

Letter returned unclaimed from former mine office, Mullan, Shoshone Co., Idaho. Lands, sundry claims, just east of the Park mine, on the southern slope of Stevens Peak, 4 miles south of Mullan, opened by 2 tunnels, longest 600', on a vein ranging up to 25' width, carrying chalcopyrite assaying about 5% copper, with quartz and calcite gangue.

CHAMPION MINING CO.

IDAHO.

Office: care of Edward R. Hall, president, Marquette Bldg., Chicago, Illa. C. T. Mixer, vice-president and manager; R. T. Badger, secretary and treasurer. Organized 1905, with capitalization \$100,000, shares 10 cents par, to develop claims in the Alder Creek district of Custer county, Idaho.

CHAMPLAIN MINING CO.

IDAHO.

Letters returned unclaimed from former mine office, Doniphan, Idaho.

MINA LA CHAPARRITA.

SPAIN.

Mine office: Nerva, Huelva, Spain. A group of 11 old mines, area 106 hectares. A little copper is produced, by cementation, from the mine waters.

CHAPPELL MINE.

VIRGINIA.

Owned, at last accounts, by Howard Mining Co.

CHARLOTTE & CONSTANCE MINES.

NEW CALEDONIA.

These properties, in the neighborhood of Bonde, New Caledonia, show large outcrops, and have been described by the French authorities as mountains of ore, but it cannot be learned that any serious attempts at development have been made.

CHARM & COPPERHEAD GROUPS.

UTAH.

In the Drum Mountain district of Utah. Are sometimes known as the Busby & Clive properties. The Charm group is said to have considerable ore blocked out, and to carry good values in copper and gold. Presumably idle.

**CHARTER OAK COPPER
MINES, LTD.**

Offices: 16, Victoria St., London, S. W.. Eng. Sir H. Seton-Karr, chairman; T. Toten Willcox, secretary. Organized June 22, 1898, with capitalization £40,000, shares £1 par; issued, £28,957. Lands, 2 claims in British Columbia, also 89 acres in Carbon county, Wyoming, latter under bond and lease to the Copper Bar Mining Co.

CHASE CREEK COPPER CO.**ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. Clarence K. McCornick, president; H. G. Smith, treasurer; S. S. Campbell, manager; I. N. Stevens, superintendent. Capitalization, \$5,000,000. Lands, 52 claims, area, 1,040 acres, circa 8 miles west of Clifton, well located next to producing mines. Development is by a 6x8' tunnel of about 600', on lands adjoining the Longfellow mine. Main tunnel cut the Longfellow ore body, of concentrating grade, at a distance of 493', and can be driven to obtain a 2,000' back. Tunnel has a single track, practically reaching the Coronado railroad, which will allow advantageous shipments. Management is good and property is regarded as promising.

CHATHAM COPPER CO.**NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. J. W. Carter, assignee. Lands include the Virginia mines, in the Burro Mountains, and a smelter at Silver City, blown in May, 1904, and quickly blown out again. Property idle, and company insolvent.

CHATTERTON MINING CO.**COLORADO**

Mine office: Pearl, Larimer Co., Colo. Is said to own the Kurtz-Chatterton mine, also claimed by the Kurtz-Chatterton Copper Mining Co., and both corporations are controlled by the National Mining & Milling Co.

CHATTERTON MINING CO.**MEXICO.**

Mine office: Talpalpa, Jalisco, Mex. N. W. Kinross, general manager. Mining property is the San Antonio y Anexas, said to have been bought, 1905, of Silvano Camberos, et al, of Guadalajara, for \$100,000.

CHAUTAUQUA MINING CO.**CALIFORNIA.**

Office: Jamestown, N. Y. Letter returned unclaimed from former mine office, Manvel, San Bernardino Co., Cal.

CHAVEZ MINE.**NEW MEXICO.**

Mine office: Riley, Socorro Co., New Mexico. A prospect only. Idle.

CHELAN COPPER CO.**WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. Said to own the Texas Jack copper claims, in Upper Horseshoe basin, Washington. Vein is claimed to be 30' between walls, in places, with a paystreak of about 20", carrying copper and silver values. Idle.

CHELAN TRANSPORTATION & SMELTING CO.**WASHINGTON.**

Office: Chelan, Chelan Co., Wash. R. D. Johnson, general manager. Has an electric line to the Holden mine, and is said to have a smelter. Presumably idle.

CHENIUS FALLS COPPER MINING CO.**WASHINGTON.**

Mine office: Fairfax, Pierce Co., Wash. Organized July, 1902, with capi-

talization \$1,000,000, by F. C. Robinson, et al, of Spokane, Wash. Lands, 2 claims, on the Chenius river, circa 7 miles from Fairfax. Idle.

CHEROKEE COPPER MINING CO.**WYOMING.**

Office: care of Harry Stone, care of Bernard McCaffrey, Equitable Bldg., Denver, Colo. Mine office: Encampment, Carbon Co., Wyo. Apparently moribund.

CHETICAMP COPPER CO., LTD.**NOVA SCOTIA.**

Office: 37 Sackville, St., Halifax, N. S. Mine office: Cheticamp, Inverness Co., N. S. Employs 20 men. John Stewart, president; Edward Stairs, vice-president; A. B. Crosby, second vice-president; John W. Regan, secretary and treasurer; Milton V. Grandin, superintendent; W. H. Strachan, auditor. Organized 1904, under laws of Nova Scotia, with capitalization \$2,000,000, shares \$1 par, as successor of the Eastern National Copper Co. and three other corporations. Lands, 150 acres, also a 200-acre mill and smelter site, 1,000 acres timber lands and 200 acres water frontage, on Cheticamp Harbor. Company also has a government license for exploring and locating mines on 50 square miles of territory.

Country rocks are micaceous schists, with ores carried in a mineral zone of 350' width by 1½ miles length, this showing 14 ore bodies, of which 3 are undergoing development, these being opened by a 200' shaft and by tunnels of 25', 30' and 115', claimed by company to show 250,000 tons of ore averaging 2.5% to 3.5% copper, 18% lead, 30 oz. silver and \$2 to \$30 gold per ton, from exclusively sulphide ore. Nearest railroad is 38 miles, but an extension is being built to within 5 miles. Property is 5 to 6 miles only from tidewater. Company plans sinking main shaft to 250', sinking a parallel shaft 1,000' distant, and connecting the two. Stock issued for properties in consolidation is in escrow until 1907. Management seems good and property is regarded as promising.

CHEWELAH COPPER KING MINING CO.**WASHINGTON.**

Office: care of S. P. Domer, general manager, Spokane, Wash. Mine office: Chewelah, Stevens Co., Wash. J. H. Long, president; J. D. Blevins, superintendent. Mine has been under steady development since circa 1896, and has a 1,300' main tunnel, showing an ore body of 30' to 40' width, carrying auriferous and argentiferous copper sulphides, averaging \$6 to \$9 per ton in total values. Ore is transported 4½ miles to Chewelah by a 125-h.p. traction engine hauling 5 ten-ton cars, and is shipped from bunkers by rail to the Granby smelter.

CHIAPAS MINING CO., LTD.**MEXICO.**

Voluntarily liquidated, August, 1904.

CHICAGO-ALGOMA NICKEL CO.**ONTARIO.**

Letter returned unclaimed from former mine office, Sudbury, Algoma, Ont. Lands, sundry claims, opened by shafts, showing cupriferos and nickeliferos pyrrhotite.

CHICAGO & ARIZONA MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Dos Cabezas, Cochise Co., Ariz. Thos. D. Chattman, president; P. B. Soto, secretary-treasurer.

Capitalization \$200,000, shares \$1 par. Lands, 210 acres. Has an ore body, apparently of good size, giving assays of \$7 to \$20 per ton, in copper, silver and gold. Property was under bond to John Brockman, at last accounts.

CHICAGO-BRITISH COLUMBIA MINING CO.

BRITISH COLUMBIA.

Mine office: Greenwood, B. C. Wm. L. Springer, president; Nicholas Kuhnen, treasurer; Geo. W. Raithel, secretary; H. H. Shallenberger, manager. Organized 1901, with capitalization \$2,000,000, shares \$1 par. Lands, 177 acres, about midway between the Granby and British Columbia mines, opened by a 165' two-compartment vertical shaft, with 75' of crosscuts, exposing good ore. Has steam power and a 6x8" Jenckes hoist. Presumably idle.

CHICAGO COPPER CO.

COLORADO.

Mine office: Salida, Chaffee Co., Colo. Chas. Peck, manager. Lands, 7 claims, showing ore giving good assays. Presumably idle.

CHICAGO COPPER REFINING CO.

ILLINOIS.

Office and works: Blue Island, Cook Co., Ills. Company has a small smelter and makes a specialty of refining copper ores rich in gold and silver, and also handles copper ores and mattes containing platinum and other rare metals.

CHICAGO-LA SAL GOLD & COPPER CO.

UTAH.

Letter returned unclaimed from former mine office, La Sal, Utah.

CHICAGO & KOOTENAY MINING CO.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Hall, B. C.

CHICAGO MINING & MILLING CO.

UTAH.

Office: care of Fred T. McGurrin, secretary, Salt Lake City, Utah. Thos. Keeley, president. Organized 1904, with capitalization \$150,000, shares \$1 par. Lands include the Wild Bill group of claims, in Beaver county, Utah. Presumably idle.

CHICAGO NICKEL CO.

ONTARIO.

Lands, sundry prospects in Drury township, Algoma district, near Worthington, Ontario, showing copper-nickel-iron ores. Moribund.

CHICAGO & PATAGONIA COPPER & GOLD MINING CO.

ARIZONA.

Office: 97 Clark St., Chicago, Ills. Mine office: Nogales, Santa Cruz Co., Ariz. Organized January, 1904, with capitalization \$250,000, by Joseph Korzeniewski, et al, of Chicago. Lands presumably are in the Patagonia district.

CHICAGO-VENTURE MINING CO.

WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. Robt. H. Young, president and general manager; S. A. McCoy, secretary and treasurer. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 patented claims, area 100 acres, showing two fissure veins in limestone, near a grano-diorite contact, of which one, averaging 15' width, is developed by shafts of 60' and 200', and by tunnels of 50' and 60'. Idle for several years.

CHICAGO & YELLOW METALS MINE.

WASHINGTON.

Mine office: Spirit Lake, Skamania Co., Wash. Lands, circa 20 claims, showing gold-copper ores, on the extension of the Norway-Sweden-Denmark belt, of Mt. St. Helens, in the valley of the North Toutle river.

CHIHUAHUA COPPER CO.

MEXICO.

Office: 267 Central St., Lowell, Mass. Mine office: Moctezuma, Chihuahua, Mex. C. M. Dickey, president; Joseph Jackson, vice-president; Clarence W. Hoyt, secretary and treasurer; Morris B. Parker, superintendent. Organized November 7, 1905, under laws of Maine, with capitalization \$600,000, shares \$1 par. Annual meeting, second Tuesday in November. On April 1, 1906, was without debt or liability, except an unaccrued payment of \$15,000, being the balance on purchase price of property, and had on hand \$10,585.86 cash, with \$24,363 due the company. Stock sales were suspended February 2, 1906.

Lands, 100 pertenencias, in the Bravos district, in the Sierra Mojena Mountains 20 miles west of Moctezuma. Property shows a large number of contact veins between limestone and porphyry, of which 4 are undergoing development, these ranging 2' to 40' in average width, and giving average assays of 8% copper, 3 oz. silver and \$1 gold per ton, from cuprite, malachite, chalcopryrite and occasional chrysocolla. Development is by several shallow shafts, deepest 75', and 9 short tunnels, longest 120', with 650' of underground openings, estimated to show 2,500 tons of ore, with 250 tons blocked out for stoping. Has a 25-h. p. hoist, good for 500' depth, and a small Gardner air-compressor, with necessary mine buildings. Property was a small producer in the past, but was tied up by litigation for some time, before secured by present owners. Company plans continuing development steadily, and shipped sufficient ore, in the first three months of 1906, to pay for the small machinery plant on hand, and all development work. Company is not a promotion scheme and has done no advertising. Management and property are regarded favorably.

CHILCAT GOLD & COPPER CO.

ALASKA.

Mine office: Haines, Alaska. Lands, 168 claims, on the Big Salmon river.

J. K. CHILD & CO.

BOLIVA.

Office and mines: Coro Coro, La Paz, Bolivia. Firm operates mines of native copper in the conglomerate strata of Coro Coro. Annual production is about 600 tons of barillas de cobre (unsmelted copper mineral), averaging circa 80% in copper tenor. Employed circa 200 men at last accounts.

SOCIEDAD CHILENA DE FUNDICIONES.

CHILE.

Letter returned unclaimed from former office, Santiago de Chile. Mine and works office: Tongoy, Ovalle, Chile. At last accounts operated the Tongoy mine, opened 1860, making about 700 tons of refined copper yearly, also the Guayacan mine, opened 1856, producing about 800 tons annually. Has smelting plants at both mines, and buys custom ores.

SOCIEDAD UNIÓN MINERA CHILENA.

CHILE.

Mine office: Cobiija, Tocopilla, Antofagasta, Chile. Operates the Condesa and Union mines.

CHILI COPPER CO., LTD.

Registered in Guernsey, March 4, 1905, with capitalization £400,000, shares £1 par. Apparently a wildcat.

CHILI COPPER SULPHATE SYNDICATE, LTD.

CHILE.

Offices: 101, Leadenhall St., London, E. C., Eng. J. E. G. Hadath, secretary. Lands are leased to Copacquire Copper Sulphate Co., Ltd.

CHILLAGOE BLOCKS. (NO LIABILITY.)**AUSTRALIA.**

Offices: 47, Queen St., Melbourne, Victoria, Australia. Mine office: Herberton, Queensland, Australia. W. W. Nicholas chairman; Thos. Rollason, secretary; W. L. Archer, mine manager. Capitalization £250,000, shares £1 par. Lands, sundry claims in North Queensland, showing tin and copper ores. Idle at last accounts and to be wound up.

CHILLAGOE COPPER PROPRIETARY, LTD.**AUSTRALIA.**

Dissolved, December 26, 1902.

CHILLAGOE RAILWAY & MINES, LTD.**AUSTRALIA.**

Office: 39, Queen St., Melbourne, Victoria. London office: Palmerston House, London, E. C., Eng. Mine office: Chillagoe, Queensland, Australia. J. S. Reid, chairman; C. L. Hewitt, secretary in Melbourne; E. Habben, secretary in London; T. J. Greenway, general manager; B. Brander, mine superintendent; J. Horsburgh, smelter superintendent; Fred Back, railway superintendent. Organized 1905, under laws of Queensland, as a second reconstruction of the Chillagoe Railway & Mines, Ltd., registered June, 1898; and New Chillagoe Railway & Mines, Ltd., registered February, 1902. Capitalization £350,000, shares 10s. par; issued, £316,000. Debentures, £498,300, at 6%, also deferred coupons for bond interest, due and overdue April 1, 1905, amounting to £44,847. Debenture holders have agreed to permanently reduce interest rate to 5%, except in years when shareholders have been paid dividends to exceed 1s. per share, in which years interest shall be 6%, and until April 1, 1908, the 5% interest on debentures shall be payable only from actual profits earned. Is the parent company of the Mungana (Chillagoe) Mining Co. Ltd.

Lands, 70 claims, area 1,800 acres, mostly held under special act of the provincial parliament, also an 80-acre smelter-site and sundry miscellaneous lands, giving total holdings of 2,935 acres, in the Walsh & Tinaroo district. Lands are in 9 groups, including the Harper, Calcifer, Fortunata, Ti Tree, Ruddygore, Queenslander, Shannon, Penzance, Atherton, Zillmantion, McIlraith, Hensey, Red Cap and Boomerang. Country rocks include Silurian limestone, sandstone and conglomerates, carrying various fissure and contact veins showing argentiferous copper and lead ores, which give average returns of about 3.5% copper-20% lead, 8% zinc, and 2 oz. silver per ton, with traces of gold. Principal properties are the Penzance and Zillmantion. Property has shafts as follows: Ruddygore, 100'; Zillmantion, 250'; McIlraith, 250'; Victoria, 106'; Harper, 368'; Penzance 200'; Queenslander, 200'; Hensey, 200'. There also are a number of other shallow shafts, and various trenches and open-cuts. The Atherton mine is a silver-lead property. The Harper has been prospected by diamond drill, and it is planned to drill the Ruddygore also. The Zillmantion shows a vein of 17' to 20' width, averaging about 5% copper on the 250' level, and the prospects of this property are somewhat improved. The mine, as a whole, has been a disappointment to date. Mine has 6 hoists, good for 500' each, and a 4-drill Rand air-compressor. Buildings include a wood and iron machine shop, carpenter shop and smithy, each 50x70', and five other mine buildings, with 11 dwellings.

The smelter, at Chillagoe, is two to ten miles from the various mines, with

which it is connected by rail. Plant includes three 200-ton water-jacket blast-furnaces, and the converter plant has one stand, with three shells of the Leghorn type. Product is a 75% white metal, carrying about 100 oz. silver and 4 dwts. gold per ton, sent to Europe for refining. Ore is exchanged with the Mungana company, giving better fluxing mixtures to both properties, and the Mungana ores also are smelted by this plant. Water is furnished by a 1,500,000-gallon dam across Chillagoe creek, this stream having a minimum flow of about 4,000 gallons per hour. Fuel is wood, coal and coke, latter, for blast furnaces, costing about 10s. per ton.

The company's railway, operated under a very liberal charter from the Queensland government, is known as the Mareeba to Chillagoe Railway, with 102 miles of main line, and is equipped with 5 locomotives and 85 cars. It is planned to extend this line about 100 miles, to Etheridge, the extension being dependent upon a government bonus. The railway is said to be earning good profits. Production, 1903, was 4,760,000 lbs. fine copper, and in 1905 was 2,266,881 lbs. fine copper.

CHIPPEWA COPPER MINING CO.**WISCONSIN.**

Reorganized, circa 1903, as Corona Copper Mining Co.

CHIRICAHUA DEVELOPMENT CO.**ARIZONA.**

Office: Marquette, Mich. Mine office: Paradise, Cochise Co., Ariz. Nathan M. Kauffman, president; Saml. R. Kauffman, secretary; Fred W. Hoar, general manager; preceding officers, Thos. F. Cole and Wm. G. Rice, directors. Organized 1903, under laws of Arizona; capitalization increased, June, 1905, to \$400,000, shares \$10 par, fully paid.

Lands, 23 claims, area 460 acres, operated by the former owner, Capt. Thos. Burns, as a silver mine, until taken over, April, 1903, by present company. Development is by tunnel and shafts. A 750' crosscut tunnel tapped the ledge at a depth of 280' by a 100' winze, sunk 700' from the portal. The ledge in the tunnel shows about 50' of leached ore, apparently the apex of a good sulphide ore body. The 400' Mars shaft is sunk at an incline, running under a heavy gossan capping of 150' to 200' width, passing through limestone much disturbed and showing leached ore in the upper part, and at the bottom considerable chalcopryite, assaying 2% to 4% copper. About 3,000' distant from the Mars is the 3-compartment vertical Planet shaft, circa 400' in depth, and drifting on the fourth level to intercept the ore body encountered in the Mars shaft. The mine is showing a considerable body of sulphide ore. Machinery equipment includes two 2,000' double-drum Lake Shore hoists, two 150-h. p. boilers, a 16-drill Sullivan air-compressor, power drills, pumps, etc., with necessary mine buildings. Nearest railroad is the El Paso & Southwestern, at Rodeo, 16 miles distant, which will build to the mine when assured tonnage to warrant construction. Management is composed of experienced and successful mining men, and geological conditions are much the same as at Bisbee, which is the nearest copper camp. Idle, June, 1906.

MINAS LA CHIRIPA y ANEXAS.**MEXICO.**

Mine office: care of Leon Lamaire y Ca., owners, Zimipán, Hidalgo, Mex. Ores carry silver, lead and copper.

CHITINA EXPLORATION CO.**ALASKA.**

Bankrupt. Property claimed is owned by Alaska Copper & Coal Co.

CHLORIDE GOLD MINING CO.**ARIZONA & CALIFORNIA.**

Office: care of J. H. Hoffman, Pueblo, Colo. Mine office: Chloride, Mohave Co., Ariz. L. Hoffman, manager. Property is the Samoa mine, a gold-silver-lead property, said to average \$4 per ton in values, opened by a 300' shaft. Company is said to plan leasing property to the Arizona Birmingham Gold Mining Co. Lands include the Iron gossan group, 11 claims in the northeastern corner of San Bernardino county, California, near the Nevada line, showing a strong iron capping, seamed with stringers of copper carbonates. The gossan gives average assays of 1.6% copper and is supposed to be the outcrop of a good copper vein.

COMPANÍA MINERA Y BENEFICIADORA**MEXICO.****DE METALES DE CHOIX, S. A.**

Is the Mexican incorporation of the Choix Consolidated Mining Co.

CHOIX CONSOLIDATED MINING CO.**MEXICO.**

Office: 43 Wall St., New York. Business Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Choix, Sinaloa, Mexico. Employs circa 20 men. R. A. Thomas, president; Thos. E. Metcalf, vice-president; J. R. Thomas, secretary; J. A. Mackechnie, general manager. Organized May, 1902, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Lands, 471 pertenencias, area 1,177.5 acres, also several mill and smelter sites, in the Choix district of Sinaloa and the Urique district of Chihuahua. Shipments of 1,062 tons of ore, December, 1900, to February, 1902, inclusive, to the Aguascalientes smelter, gave returns ranging from 19.5% up to 28% copper, with gross values of \$127,915.44 and net values of \$47,940.61. Lands are on both sides of the Fuerte river, and on the line of the Kansas City, Mexico & Orient R. R., now being built to Topolobampo, and at present only 30 miles from the mines. Ore bodies are said to measure from 50' to 300' in width, occurring as contacts between porphyry, diorite and limestone. Also has some gold mines, occurring as fissures in granite and quartzite. Properties include a number of antiguas, and when the railroad is completed to the mines, they should be able to produce to advantage. Ore shipped, 1900-1902, was packed on burros to Topolobampo, and sent thence to Guaymas by steam, thence by rail to Nogales and El Paso, and thence to the smelter at Aguascalientes, a distance of nearly 2,000 miles, notwithstanding which a fair profit was secured. Rail connections are hoped for soon, and it is planned to build a smelter. Lands are owned outright, and the company is free from debt. Property apparently is one of promise.

CHOTA NAGPUR MINES.**INDIA.**

At Chota Nagpur, Bengal, India. Were worked in very ancient days. Ore occurs as chalcopyrite, disseminated in schistose rocks. Idle since 1902-03, when a local company did a little development work.

CHTASTIE MINE.**BULGARIA.**

Office: care of MM. Stojanoff, Varbanoff & Co., Plevna, Bulgaria. Mine office: Belogradchik, Vidin, Bulgaria. Lands, 250 hectares, held under lease from the principality, showing 2 fissures averaging 30" width and 600' length,

carrying chalcopryite assaying 18% copper, 8 oz. silver and 2 dwts. gold per ton. Has 3 shafts, deepest 280', and 15 short tunnels, with about 5,000 tons of ore in sight. Presumably idle.

COMPANIA MINERA DE LA CIENGUIA, S. A.

MEXICO.

Is the Mexican incorporation of the Cienguita Copper Co.

CIENGUIA COPPER CO.

MEXICO.

Office: 1303-25 Broad St., New York. Mine office: Minas de Cienguita, Sahuaripa, Sonora, Mex. Employs about 400 men. Geo. Beebe, president and general manager; J. H. Wilhelm, vice-president; C. W. Wilhelm, secretary and treasurer; Frank Fits, general superintendent; Jesse Scobey, assistant superintendent. Organized May 8, 1901, under laws of Arizona, with capitalization \$10,000,000, shares \$10 par; issued, \$6,700,000. Was reincorporated, 1905, under laws of Nevada, and property transferred from the old to the new corporation, authority therefor being said by management to have been conferred by vote of 90% of the shareholders, but suit has been brought in the district court of Phoenix, Arizona, by some of the dissatisfied shareholders in the old corporation. A portion of the stock issue of the old company also is in dispute.

Lands, 937 pertenencias, area 2,347 acres, circa 40 miles southeast of Sahuaripa, also about 30,000 acres of forest and grazing lands, all fairly watered and timbered. Lands include the Mina Real de la Tayapa, the Minas de las Cienguitas and the Ostimuri mines. Country rocks are granite, porphyry, diorite and quartzite, ores occurring in contact veins between granite and quartzite. Development is by shafts of 125' and 136' and by 18 tunnels of 35' to 1200', 6 being of 400' to 1,200' length each, giving about two miles of underground openings. Company estimates 2,000,000 tons of ore in sight, with 300,000 tons blocked out for stoping, which estimate is absolutely unwarranted. Veins are of practically vertical dip and 13 orebodies have been located, 5 of which are being developed, these ranging from 3' to 60' in width, being traceable 3 miles in length in one case, and are opened to depth of 800' by one tunnel, the veins carrying sulphide ores claimed to give average values of 5% copper, 70 oz. silver and \$3 gold per ton.

Equipment at the mine includes a 100-h. p. steam plant, with 6-drill air-compressor, 30x60' stone machine-shop, assay office, store, miscellaneous mine buildings and 120 dwellings for employes.

Smelter, one-fourth mile from the portal of the principal tunnel, and receiving ore therefrom by tramline, has two 75-ton reverberatory furnaces and a 75-ton calcining furnace, producing matte averaging about 24% copper, 280 oz. silver and \$12 gold. Ores are claimed to give smelter returns of 4.8% copper, oz. silver and \$2.40 gold per ton. Fuel is inferior wood, costing \$3 per cord. In March, 1906, one furnace in operation, was said to be treating 50 tons of ore daily. Expenses are about \$10,000 per month, and company closed 1905 with a considerable cash balance on hand, and \$18,000 due on the smelter. Mr. Wm. A. Farrish, who reported on the property, estimates that costs of mining and reduction should not exceed \$7.50 per ton. The property is of value, but is poorly located as to transportation facilities, and company's estimates of ore reserves, production and profits are over-sanguine.

CINCINNATI CONSOLIDATED MINING CO.**UTAH.**

Office: care of A. Hanauer, Jr., Salt Lake City, Utah. Lands are in Beaver county, Utah. Not a producer, and refuses to give any statement.

CIRCUMSTANCE GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Huron, Yavapai Co., Ariz. Presumably idle.

CITY ROCKS MINING CO.**UTAH.**

Office: care of Jas. P. Edwards, secretary, Houghton, Mich. Mine office: Alta, Salt Lake Co., Utah. Robert L. Edwards, superintendent. Property is held under bond and lease by Messrs. Wm. S. Cleaves, James P. Edwards and John Slockett, and payments have been made on the bond. Development is by tunnel, showing an 18' ore body of exceptional promise. Property has produced \$587,000 ore values in the past. Assays of 13% to 18% copper have been secured. Plans shipping ore over the Continental Alta's 5-mile aerial tram.

CLAIRE COPPER CO.**IDAHO.**

Mine office: Montpelier, Bear Lake Co., Idaho. G. C. Gray, president and treasurer; A. D. Young, secretary. Organized Sept. 16, 1902, under laws of Idaho, with capitalization \$200,000, shares 50c. par. Lands, 3 claims, area 60 acres, in an unorganized mining district of Bear Lake county. Veins occur as fissures in sandstone, and as contacts between limestone and porphyry, giving ores assaying 4.6% copper, 10 oz. silver and about \$1 gold, from a 12" vein carrying cuprite, melaconite, diopside and chrysocolla, opened by tunnels of 100' and 200'. Presumably idle.

CLAIRMONT MINE.**MONTANA.**

Mine office: Stevensville, Ravalli Co., Mont. Amos Buck & Co., owners.

CLARA COPPER CO.**UTAH.**

Letter returned unclaimed from former mine office, Thompson, Utah.

CLARA GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Clara, Yuma Co., Ariz. J. E. Rodgers, manager. Lands, sun-dry claims on Black Mountain, about 25 miles east of the Colorado river, showing a 30' to 50' vein carrying good gold values. Territory is to be opened by the Arizona & California railroad.

CLARA MINING & SMELTING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized May, 1906, by Dr. T. A. Grigg, John Crozier and Hugh Gillis, of Butte, with a paid-in capital, supposedly all in cash, of three dollars. This would be 20,000 reis, in Brazilian money.

CLARA ST. DORA COPPER MINING CO.**AUSTRALIA.**

Succeeded, 1897, by New Clara St. Dora Copper Mining Co. No Liability.

CLARK CONSOLIDATED MINING CO.**ARIZONA.**

Letter returned unclaimed from former office and mine, Douglas, Cochise Co., Ariz. J. R. Clark, president; R. H. Skiles, secretary and treasurer; W. H. McIvens, manager. Lands, 10 claims, circa 10 miles east of Douglas, showing veins of 3' to 10' width, carrying ores of copper, lead, silver and gold, assaying up to 8% copper, with \$30 to \$35 gold, silver and lead per ton, opened by a 60' shaft.

CLARK MINE.**MICHIGAN.**

Lands, circa 2,500 acres, lying south of Copper Harbor, Keewenaw county,

Michigan. Opened 1858, and idle many years. Total production 93 tons, 1,915 lbs. fine copper. Was owned by Edouard A. J. Estivant, Paris, France, but is now controlled by the Calumet & Hecla Mining Co., presumably by purchase in 1905, though possibly held under option. Was tested, 1905, by diamond drills.

KONIGLICHE HUTTENAMT CLAUSTHAL.**GERMANY.**

Works office: Clausthal, Hanover, Germany. Herr Bergrat Boltze, manager. Property is a silver-copper smelter, operated under state auspices.

CLAYTON MINING & SMELTING CO.**IDAHO.**

Mine office: Clayton, Custer Co., Idaho. Lawrence Green, general manager. Lands, 18 claims. Ores carry silver, lead and copper. Has water and steam power and a 50-ton smelter. Presumably idle.

CLEAR CREEK MINING & REDUCTION CO.**COLORADO.**

Mine office: Russell Gulch, Gilpin Co., Colo. F. R. Carter, superintendent. Property is the Saratoga mine, carrying gold, silver and copper ores. Has steam and electric power, and owns a pyritic smelter, at Golden, Colorado.

CLEOPATRA COPPER CO.**ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Employs 15 men. Geo. W. Hull, president, treasurer and general manager; H. E. Wilcox, secretary. Organized 1902, under laws of Arizona, with capitalization \$4,000,000, shares \$1 par. Lands, 13 claims, 11 patented, area circa 200 acres, in the Verde district, showing sundry fissure and gash veins, of which several are being developed, these giving ores assaying 1% to 65% copper and 1 oz. to 500 oz. silver, with fair gold values. Has 6 shallow shafts, of 25' to 150' depth, and 9 tunnels, of which the 3 longest are 200', 275' and 1,750', principal tunnels being known as the Dillon and Winningham, with a total of nearly one mile of underground openings, estimated by company to put 2,000,000 tons of ore in sight. Equipment includes steam plant with hoists and air-compressor, and necessary buildings. Material for 100-ton smelter was delivered January, 1906, and it was planned to have same in blast by July, 1906. Property seems well managed, and apparently is making fair progress.

CLEOPATRA GROUP.**CALIFORNIA & OREGON.**

Office: care of F. H. Osgood, Seattle, Wash. F. H. Osgood and J. S. Crawford, owners. Lands, 45 claims and a 40-acre millsite, in Del Norte county, California and Josephine county, Oregon. Slight development shows good ores, and native copper in masses up to several hundredweights. District is isolated and difficult of access.

CLEVELAND-ARIZONA MINING CO.**ARIZONA.**

Office: Tucson, Ariz. Mine office: Red Rock, Pinal Co., Ariz. Capitalization \$350,000, shares \$1 par. Lands, 10 claims, lying south of the Imperial mine, in the Silver Belt Mountains, within 7 miles of the Arizona Southern railway, in the Silver Belt or Ajo Basin district. Country rocks are granite, quartzite and limestone, with ore bodies occurring as contact veins, carrying sulphides at depths of 55' to 150'. Gangue usually is granite and lime-porphry. Developments are said to be of a favorable nature.

CLEVELAND GROUP.**NEW MEXICO.**

Mine office: care of Geo. H. Utter, Silver City Grant Co., N. M. Lands, 120 acres, 8 miles south of Silver City, on the west slope of the Pinos Altos Mountains, showing ores carrying copper, zinc, silver and gold. It is planned to begin shipments, 1906, to the Comanche smelter.

CLEVELAND & MONTANA MINE**MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Lands were sundry claims in Leslie Gulch, opened by a 90' tunnel.

CLIFF MINE.**MICHIGAN.**

Owned by Tamarack Mining Co.

CLIFTON-ARIZONA COPPER CO., LTD.**ARIZONA.**

Succeeded by Clifton Consolidated Copper Mines of Arizona, Ltd.

CLIFTON CONSOLIDATED COPPER MINES OF ARIZONA, LTD. ARIZONA.

Absorbed, 1903, by New England & Clifton Copper Mines of Arizona.

CLIFTON COPPER BELT MINING CO.**UTAH.**

Office: 24-65 West Second South St., Salt Lake City, Utah. Clyde H. Wilson, president; Frank L. Wilson, secretary, treasurer and general manager. Capitalization \$25,000, shares 5c par. Lands are in the Deep Creek district of Utah. Has secured assays of 35.5% copper, 9 oz. silver and \$1.20 gold per ton.

CLIFTON COPPER MINES, LTD.**ARIZONA.**

Office: 52 Wall St., New York. Lands, 8 claims, area 163 acres, lying east of the Standard mine. Is controlled by Standard Consolidated Copper Co.

CLIFTON COPPER CO.**NEW MEXICO.**

Office: Deming, N. M. Mine office: Santa Rita, Grant Co., N. M. J. L. Burnside, president; F. F. Rogers, secretary; M. M. Z. Elliott, superintendent. Organized 1900, with capitalization \$500,000, shares \$5 par. Lands, in the Central district of Grant county, were in litigation, but company secured a satisfactory settlement, October, 1903. Mine has 5 shafts, deepest 235', showing an ore body, said to be 40' to 50' wide and a half-mile long, carrying oxide, carbonate and sulphide ores, with occasional native copper. Ore is of concentrating grade, with occasional high-grade paystreaks. Mine shows considerable ore ready for stoping. Has steam hoists and a 65-ton concentrator with 2 Huntington mills, 2 Wilfley tables and 2 Standard concentrators. Presumably idle.

CLIFTON COPPER MINING CO.

Presumably dead. A stock-jobbing scheme, promoted, 1898, by Julius Leszynskyj, of New York.

CLIFTON TINTO COPPER MINES, LTD.

Voluntarily wound up, March, 1903.

CLIMAX GROUP MINING CO.**WASHINGTON.**

Office: care of E. W. Berry, 1203 Maxwell Ave., Spokane, Wash. Mine office: Baring, King Co., Wash. J. J. Browne, president; J. W. Douglas, vice-president; Frank P. Smith, general manager. Organized under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Lands, 9 claims, area 180 acres, also a 20-acre millsite, in the Index district. Country rocks are granite and diorite, showing several contact veins, of which two

are developed by a 35' shaft, two short tunnels and a 345' tunnel, latter not yet in ore. Ores are bornite and chalcopyrite, giving assays of 3% to 34% copper, 20 oz. to 70 oz. silver, and from a trace to \$6 gold per ton. Property idle several seasons, except for assessment work, but management planned resuming operations during 1906.

CLIMAX MINING CO.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, president. Property is the Spondulix mine, carrying ores of gold, silver and copper.

CLIMAX MINING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Ouray, Ouray, Co., Colo. Property was the Silver Link mine, carrying ores of gold, silver and copper.

CLIPPER MINING CO.**WASHINGTON.**

Office: 501 Provident Bldg., Tacoma, Wash. Mine office: North Bend, King Co., Wash. Employs 12 men. A. J. Weaver, president and general manager; W. S. Jackson, vice-president; A. R. Watson, secretary; R. C. Watson, treasurer; Jas. R. Shearing, mine superintendent; A. Koberle, engineer. Organized November, 1901, under laws of Washington, with capitalization \$2,500,000, shares \$1 par. Title changed, circa 1905, from original name of Sure Thing Gold-Copper Mining & Smelting Company. Lands, 7 claims, area 140 acres, also 2,900 acres miscellaneous lands, in the Burns district, showing 7 fissure veins in granite, of which one, undergoing development, is reported by company to average 45' width. Development is by tunnels of 200', 300' and 600', with 1,175' of underground openings, showing ore reported by company to carry average values of 4.1% copper, 2 oz. silver and \$2 gold per ton. These values are only a fraction of those formerly reported by the Sure Thing company, and probably are much nearer the truth. Has water power and hopes to secure rail connections, by a 24-mile line, on which it was planned to begin work April, 1906.

CLONCURRY COPPER SMELTING CO., LTD.**AUSTRALIA.**

Succeeded, 1895, by New Cloncurry Copper & Smelting Co., Ltd.

CLUIN COPPER DEVELOPMENT SYNDICATE, LTD.**IRELAND.**

Offices: 100, Winchester House, London, E. C., Eng. Mine office: Aillibies, County Cork, Ireland. R. J. Norton Dawson, chairman; A. E. Middleton, secretary. Organized Aug. 26, 1904, with capitalization £10,000, shares £1 par; issued, £4,567. Property is an option to lease, at £20 yearly, plus 5% royalty, a tract of about 900 acres, lying southwest of lands of the Berehaven Copper Mines, Ltd. Property is undergoing exploration.

CLUSTER MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands lie between the Bingham Consolidated and United States mines. Management planned to develop property by a 1,000' tunnel. Idle.

COAHUILA MINING & SMELTING CO., LTD.**MEXICO.**

Office: Apartado 72, Monterey, N. L., Mex. Mine office: Viesca, Coahuila, Mex. Employs circa 500 men. G. F. Meehan, president; Frank J. Llewellyn, vice-president; Walter E. Parker, secretary and general man-

ager; F. W. Draper, superintendent. Operates the Santa Maria, Sultana and other mines, carrying ores of copper, lead, silver and gold, opened by a 700' main shaft and a 1,000' main tunnel. Has steam and electric power and a 250-ton smelter, blown in early in 1903, smelter and mines being connected by railroad. Smelter is said not to be operated regularly. Is conducted as a close corporation, company making no returns in response to questions. The general manager states that the company is increasing its cash surplus. Production, 1903, was 178,865 lbs. fine copper.

COAST LINE COPPER CO.

MEXICO.

Office: La Calera, Altar, Sonora, Mex. John T. Cave, president; Judson A. Elliott, secretary; John Henderson, general manager. Organized, 1902, as successor of the Porvenir de Sonora company. Lands include a gold property at El Oro, 14 miles from Pozo, in the Ures district, and a copper property, formerly a profitable silver producer, in the Altar district. Gold mine has a plant with Huntington mills. At close of 1905, management was endeavoring to arrange for resumption of work at the gold property.

COAST RANGE COPPER CO.

Incorporated January 16, 1903, at Roseburg, Oregon, with capitalization \$25,000, in 500 shares, par \$50, by T. R. Sheridan, et al.

COBAR CHESNEY COPPER & GOLD MINING CO.

AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. Employs about 100 men. J. Woolcock, manager. Was opened as a gold mine, the outcrop carrying no copper, but at depth of 155' carbonate ores were found, and at 250' depth chalcopyrite, coated with melaconite, in considerable quantities. Main shaft is about 600' in depth, in ore carrying 2% to 8% copper and about 3 dwts. gold per ton, showing one 35' ore body, averaging 3% copper for a length of 800'. Has steam power, 10-stamp mill and 25-ton concentrator, ore and concentrates being smelted at the Great Cobar works. Produces about 150 tons fine copper yearly. The concentration process, given a trial at the mine, has not proven a success, ores averaging about 3% only.

COBRE DE GRANDE MINING CO.

MEXICO.

Office: Bisbee, Ariz. Lands, sundry claims, in Sonora, Mexico, slightly developed by tunnels, showing high grade auriferous copper ore.

CORBE GRANDE COPPER CO.

MEXICO.

Absorbed by Cananea Consolidated Copper Co., S. A. Sundry shareholders are engaged in litigation, hoping to get something from the Greene Consolidated, but with poor prospects of success.

COBRE MINING CO.

ARIZONA.

Same as Del Cobre Consolidated Mining Co.

COBRELOMA CONSOLIDATED COPPER CO.

ARIZONA.

Office; 212 Henne Bldg., Los Angeles, Cal. Mine office: Middlemarch, Cochise Co., Ariz. Richard Gird, president; M. M. O'Gorman, vice-president; Wm. J. Gird, secretary and treasurer; preceding officers, Robert C. Davis and Edw. C. Kelley, directors. Organized under laws of California, with capitalization \$1,000,000, shares \$50 par; issued, \$500,000. Lands, 43

claims, in 9 groups, which have had more or less desultory development in the past, 9 miles west of Pearce, present terminus of the Arizona & Colorado railroad. Surface indications are promising, but development, which is to a limited depth only, has as yet shown no large ore bodies. Property is opened by the 165' Ella shaft, showing 4% ore; the 105' Emma shaft and the 120' Emma tunnel, the 344' Iron Age tunnel, crosscutting a 12' vein, and the 386' Carpena tunnel, planned to cut rich ore outcropping on the surface of Richmond Hill, and a 90' tunnel on the Cobreloma claim, planned to penetrate Copper Glance Hill, which shows sulphide ore in a 70' shaft. There also are several other shallow shafts. Ore occurs in a mineral zone carrying 6 distinct veins, which are substantially parallel, limestone and porphyry being the country rocks, with a garnet capping that is 200' wide in places. Property has steam power and a telephone system, and is regarded as promising. It is planned to consolidate, 1906, with the Middlemarch Copper Co.

COMPAÑIA COBRIZA.**MEXICO.**

Letter returned unclaimed from former mine office, Tepezalá, Aguascalientes, Mexico.

MINA LA COBRIZA.**MEXICO.**

A mine, at Matehuala, San Luis Potosí, Mexico, operated by the National Metallurgical Co.

COMPAÑIA MINERA LA COBRIZA.**MEXICO.**

Mine office: San Dimas, Durango, Mexico.

COMPAÑIA MINERA COBRIZA y ANEXAS.**MEXICO.**

Mine office: Alamos, Sonora, Mexico. Manuel Salazar y Perron, manager. Ores carry gold, silver and copper. Mine is opened by shafts and tunnels.

MINA COBRIZAS.**BOLIVIA.**

Office and mine: Lipéz, Bolivia. Is a considerable producer of native copper, making more or less silver as a by-product.

COCHISE CONSOLIDATED COPPER CO.**ARIZONA.**

Office: 1404 Arrott Bldg., Pittsburg, Pa. Mine office: Paradise, Cochise Co., Ariz. Employs about 50 men, mainly Mexicans. Henry F. Alexander, president and general manager; W. C. Hagan, vice-president; Howard H. Douglas, consulting engineer; Harry Holburn, superintendent; C. S. Hagan, mill superintendent. Capitalization \$1,500,000, shares \$1 par. Lands, 17 claims, including the Davis group of 13 claims, bought for \$82,500, lying about 6 miles northeast of Paradise, where the company has platted a townsite called Pittsburg. The 150' Ainsworth shaft is sunk at an angle of 60°. The Treasure shaft shows a 4' vein giving average assay values of about \$75 per ton in copper, gold and silver. The 180' two-compartment Duplex shaft shows mixed sulphides, carrying high values in copper, gold and silver, and containing heavy percentages of zinc. Machinery includes Webber 5-h. p. and 150-h. p. gasoline engines, and a small electric light plant. The mine shipped some ore to smelters, late in 1904, and is building a concentrator, which should be in operation before

end of 1906. The mill is 62x100', 45' high, and is to have one crusher, 3 sets of rolls, 3 elevators, 2 jigs and 2 settling tanks. Water is supplied from two wells and is pumped into five 6,000-gallon tanks, mill requiring about 2,500 gallons daily. The property seems to be vigorously managed and is considered promising.

COCHISE COPPER MINING CO.

ARIZONA.

Reorganized, August, 1905, as Cochise Development Co.

COCHISE DEVELOPMENT CO.

ARIZONA.

Office and mine: Bisbee, Cochise Co., Ariz. Employs 30 men. L. C. Shattuck, president; C. L. Jones, vice-president and general manager; Harry Duey, secretary; Joseph M. Muheim, treasurer; R. J. Ledwich, mine superintendent. Organized August 1, 1905, under laws of Arizona, with capitalization \$1,000,000, shares \$10 par, as successor to the Cochise Copper Mining Co. Annual meeting, second Tuesday in January. Lands, 15 claims, area 175 acres, abutting on the Holbrook mine of the Copper Queen Consolidated. Has a 300' two-compartment shaft, with a drift on the 300' level showing small bunches of sulphide ore. Shaft is being cut down to 3-compartment size, and is to be sunk to the porphyry-schist contact, and crosscuts driven thence to the presumed ore body. Machinery includes a 10x30' first-motion double-drum hoist, good for 1,200', a 6-drill Sullivan straight-line air-compressor and a 100-h. p. Atlas boiler. Has an engine-house, boiler-house, 20x40' carpenter shop, 20x30' smithy and a coal trestle. Property is considered promising.

COCHISE EXPLORATION & DEVELOPMENT CO.

MEXICO.

Office: Bisbee, Ariz. Mine office: Fronteras, Sonora, Mexico. Lands, sundry claims at the southern end of the Ajo Mountains, about 25 miles west of Fronteras, showing ores assaying well in copper, lead, silver and gold.

COCHISE MINING & MILLING CO.

ARIZONA.

Dead.

COCHISE PROSPECTING, MINING & DEVELOPMENT CO.

MEXICO.

Succeeded, January 25, 1906, by Brooks Consolidated Copper Co.

COCONINO COPPER CO.

ARIZONA.

Letters returned unclaimed from former office, Chicago, Ill., and former mine office; Ryan, Coconino Co., Ariz., via Kanab, Utah. Donald Grant, president; L. P. Boyle, secretary; W. S. McCornick, treasurer; E. P. Jennings, general manager. Organized 1901, under laws of New Jersey, with capitalization \$6,000,000, shares \$10 par. Lands, 33 claims, area 660 acres, also 80 acres miscellaneous lands, showing blanket veins carrying carbonate ores, estimated to average 10% copper, which are stripped and worked open-cast. Estimated amount of ore in sight is 500,000 tons, with 100,000 tons blocked out for stoping. Reduction plant, at Ryan, 7 miles from mine, receiving ore by wagons, has a 100-ton Neill leaching plant and a small smelter. Property is leased to Esmeralda Copper Precipitating Co.,

COLDWATER COPPER MINING CO.

COLORADO.

Office: 232 West Cedar St., Kalamazoo, Mich. Mine office: Encampment, Carbon Co., Wyo. Employs 30 men. Z. L. Baldwin, president;

E. S. Drury, vice-president; Edwin Gillis, secretary and treasurer; Burr Lobdell, general manager. Organized May 18, 1900, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area circa 50 acres, also 20 acres miscellaneous lands, in the Pearl district of Larimer county, Colorado. Property is known as the Wolverine mine. Country rocks are granite and diorite, with 3 fissure veins, of which one, of 20' estimated width, shows oxide and carbonate ores, and native copper, with sulphides at a little depth, estimated to carry an average of 10% copper and 8 oz. silver per ton, opened by shafts of 80' and 170', bottom of principal shaft showing massive chalcocite and a little disseminated chalcopyrite, of high average grade. Developments are regarded as promising. Has steam power. Property has been leased, for a 3 to 5 year term, to the Wolverine Leasing & Mining Co., composed of Coldwater shareholders, and was producing 50 to 70 tons of ore daily, in spring of 1906.

SOCIEDAD COLECTIVA.**CHILE.**

Said to operate the Tiltit mine, department of Santiago, Chile. Title given probably is incomplete.

COLOMBIA GOLD & COPPER CO.**COLOMBIA.**

Thos. S. Moffat, president and Pooh-Bah. Capitalization, \$125,000, shares \$10 par. Lands are sundry undeveloped government concessions, in the Republic of Colombia.

COLONIAL COPPER CO.**NOVA SCOTIA & ONTARIO.**

Office: 716 Law Bldg., Baltimore, Md. Mine office: Cape D'Or, Cumberland Co., Nova Scotia. J. A. Hanway, president; W. J. Sneeringer, vice-president; Chas. J. Griffith, secretary; F. B. Speed, treasurer; Reginald W. Petre, general manager; S. M. Archibald, mine superintendent. Organized January 19, 1899, under laws of West Virginia, with capitalization \$5,000,000. Bonds, \$300,000 authorized, at 6%; issued, \$116,000. Lands, circa 2,000 acres, well timbered, showing 6 contact veins, of which 3, undergoing development, are said to average 25' width, and to carry 2.5% copper. Development is by a 500' incline shaft and 2 vertical shafts. Equipment includes 3 large and 6 small hoists, 3 Rand air-compressors and sundry small mine buildings. Property has a 400-ton concentrator, with Blake crushers, rolls and 15 jigs, connected with the mine, 1½ miles distant, by a 36" narrow-gauge railroad. Nearest railway is 30 miles, but property is located on the Bay of Fundy, and receives machinery and supplies by water. Company also owns the New Annan mine, carrying sulphide ore in lenses, and the Chandos mine, in Peterboro county, Ontario, latter showing a 4' vein, assaying 8% copper, but idle for some years.

Company was in financial straits and a petition in bankruptcy was filed, 1905, but was dismissed later, through a practical reorganization, by shareholders, leading to a general change in the management.

COLONIAL COPPER CORPORATION, LTD.**AUSTRALIA.**

Offices: 615, Salisbury House, London, E. C., Eng. G. Hardie, chairman; C. P. Oswald, secretary; J. Wills, mine manager. Organized March 29, 1899, with capitalization £125,000, shares £1 par; issued, £102,507.

Lands, 245 acres, freehold, 20 miles from Lithgow, Robinson county, New South Wales. Idle for some years.

COLORADO-BOHEMIA MINING & MILLING CO.

COLORADO & OREGON.

Office: 15, William St., New York. Albert Hawkins, president; G. B. Henzer, secretary and treasurer. Organized under laws of Colorado, with capitalization \$1,250,000, shares \$1 par. Lands, sundry gold and copper claims, in various districts of Oregon and Colorado.

COLORADO & CONNECTICUT GOLD MINING CO.

COLORADO.

Office: 35, Wall St., New York. Wm. Garlick, president; A. S. Garlick, secretary. Organized 1902, under laws of South Dakota, with capitalization \$400,000, shares \$5 par, non-assessable. Lands, 3 claims, area 21 acres, known as the Dolly Varden mine, in the Galena district of Hinsdale county, Colorado. Company is prospecting three 2' fissure veins, giving assays of 9% to 19% copper, with good silver values, from chalcopyrite, tetrahedrite, and occasional argentite. Has a 50' shaft and an 800' tunnel. Company's prospectus quotes Edwin J. Hulbert as predicting (in 1879) that this property will equal the Calumet & Hecla as a dividend-payer. Presumably idle.

COLORADO CONSOLIDATED MINING CO.

COLORADO.

Mine office: Cochetopa, Saguache Co., Colo. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill.

COLORADO COPPER CO.

A swindle, perpetrated by the notorious Wm. F. Wernse gang, of St. Louis.

COLORADO COPPER CO.

NEW MEXICO.

Office: care of Dr. H. W. Queen, Alva, Okla. Letter returned unclaimed from former mine office, Clayton, Union Co., N. M. J. W. Foster, president; T. S. Chambers, treasurer. Organized 1905. Lands, sundry claims, apparently undeveloped, in Cimarron Cañon, near Clayton.

COLORADO COPPER SYNDICATE, LTD.

Voluntarily wound up, April, 1901.

MINA COLORADO.

MEXICO.

Office: care of Independence Grove, owner, Guadalajara, Mexico. Lands, 10 pertenencias, area 25 acres, on the Rio Palmarejo, 12 miles west of Ameca, Jalisco, Mexico, showing a vein of about 6' width, carrying auriferous and argentiferous copper and iron sulphides, opened by a 700' tunnel.

MINA COLORADO.

MEXICO.

Mine office: care of Don Carlos Yanes, owner, San Xavier, Sonora, Mexico. Presumably idle.

COLORADO COPPER MINING CO.

COLORADO.

Claimed lands near Salida, Chaffee county, Colorado. Organized under laws of New Mexico, with capitalization \$5,000,000. Apparently a mere stock-jobbing scheme.

COLORADO MINING & DEVELOPMENT CO.

MONTANA.

Title changed, 1904, to Wickes-Corbin Copper Mining Co.

COLORADO MINING & SMELTING CO.

MONTANA.

Succeeded, 1905, by Trenton Mining & Development Co.

COLORADO RIVER GOLD & COPPER CO.

CALIFORNIA.

Office: 503 Bradbury Blk., Los Angeles, Cal. Mine office: Mellen, San Bernardino Co., Cal. Employs 4 men. Geo. E. Bouton, president; W. O. Dresbach, vice-president; T. M. Drennan, secretary and treasurer; E. S. Gannon, assistant secretary; Henry Seltzer, general manager. Organized July 1, 1901, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par; issued, \$1,800,000. Lands, 10 claims, area 200 acres, also a 5-acre smelter-site, in the Monumental district, showing ore bodies occurring as fissure veins in limestone, granite and quartz-porphry, of which one vein, of 3' to 15' width, is opened by shafts of 60' and 75', and by four tunnels of 30' to 180' length, giving about 1,200' of underground openings, estimated to show 18,000 tons of ore, with 10,000 tons blocked out for stoping. Average assay values are 8% copper, 1 oz. silver and \$15 gold per ton, from malachite, chalcopryite and pyrrhotite. Company plans continuing development, and hopes to secure the building of a smelter, in the Empire Flats district, during 1906.

COLORADO SPRINGS COPPER MINING & TUNNEL CO. COLORADO.

Property sold, January, 1906, to Michigan & Colorado Mining & Milling Co.

COLOSSAL GOLD & COPPER CO.

UTAH.

Organized, 1902, with capitalization \$600,000, by F. F. Brown, Wallace W. Wait, et al, at Salt Lake City, Utah, to take over the C. M. C. group of claims, in Beaver county, Utah. No trace of operations.

COLUMBIA COPPER CO.

ARIZONA.

Dead, with suspicions of foul play. Lands sold, under judgment, for \$4,000.

COLUMBIA COPPER MINING CO.

ARIZONA.

Merged in Consolidated King Development & Columbia Copper Co.

COLUMBIA COPPER MINING CO.

BRITISH COLUMBIA.

Office: care of E. P. Wheeler, president, Conconully, Wash. Mine office, Princeton, Yale district, B. C. Lands, sundry claims, including the Gladstone, in the Similkameen district, showing a fissure vein of 5' to 7' width, in syenite and trap, carrying disseminated bornite, assaying 5 %to 6% copper, with fair gold and silver values.

COLUMBIA COPPER MINING CO.

UTAH.

Property sold, 1903, to Ohio Copper Co.

COLUMBIA COPPER MINING CO.

WYOMING.

Last heard of company was in December, 1902, when it was being sued, for sundry mining claims, by the Duchess Mining, Milling & Smelting Co.

COLUMBIA GOLD & COPPER CO.

Office: 27 Central St., Boston, Mass.

COLUMBIA GOLD & COPPER MINING & SMELTING CO.

Office: Rosalia, Wash. Moribund.

COLUMBIA MINING CO.**CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. H. R. Gunn, manager. Lands, sundry claims, 7 miles southwest of Needles, on which development work was in progress, at last accounts.

COLUMBIA MINING CO.**NEVADA.**

Office: Los Angeles, Cal. Mine office: Geodspings, Lincoln Co., Nevada. Lands, 6 claims, said to show a 30' vein, averaging 15% copper, which probably is an overestimate. The Extension vein, opened to a depth of 230' and 3' wide, shows ore chiefly carbonates and oxides, assaying highly in copper and carrying about \$10 gold per ton. Mine is said to be prepared to produce 25 tons daily, and hopes to ship 75 tons daily, to the Geodspings smelter, by August, 1906.

COLUMBIA RIVER GOLD MINING CO.**WASHINGTON.**

Mine office: Kettle Falls, Stevens Co., Wash. J. M. Fish, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

COLUMBUS BUTTE MINING CO.**MONTANA.**

Office: Columbus, Ohio. Mine office: 901 West Copper St., Butte, Silver Bow Co., Mont. M. J. Bergin, president; Edw. Higgins, manager. Lands, 5 claims, including the Jennie Dell mine and the Eveline, October, Twilight and Lamonta claims, latter held under a \$33,000 bond and lease. Lands are west of the Lexington, lying west of Missoula Gulch. Principal operations, on the Eveline, are said to show an ore chute on the 150' level, assaying 450 oz. silver and \$50 gold per ton. The Jennie Dell has a 450' shaft, showing, 1% copper, with gold and silver values, at a depth of 358', on a 10' vein, supposed to be a continuation of the Lexington vein. Management plans sinking a new 300' three-compartment shaft, on the Lamonta, but was in bad shape financially, in May, 1906.

COLUMBUS CONSOLIDATED MINING CO.**UTAH.**

Office: 37 Commercial Blk., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs circa 100 men. Anthony O. Jacobson, president and general manager; Clarence K. McCornick, vice-president; S. A. Whitney, secretary and treasurer; preceding officers, W. S. McCornick and Edward R. Hall, directors; McCornick & Co., registrars. Organized 1902, under laws of Utah, and capitalization increased, 1904, to \$1,500,000, shares \$5 par.

Lands, 17 claims, area 275 acres, on both sides of Little Cottonwood Cañon, mainly on Old Flagstaff Hill, showing 9 fissure and contact veins, 6 said to average 12' width, and to carry estimated values up to 8% copper, 18% lead, 15% zinc, 60 oz. silver and \$4.50 gold per ton. Principal ore bodies are fissures and contacts, in limestone and quartzite, with highly mineralized sections ranging 30' to 100' wide, for several hundred feet in length. Ores are carbonates on surface, and sulphides at depth. Shipping ore runs \$10 to \$60 per ton in value. Concentrating ores are reduced 4 or 5 into 1, and 327 tons of concentrates, made 1904, averaged \$21.39 in value. Mine is opened by 4 shallow shafts and 3 tunnels,

longest 900', with about 2 miles of underground openings, and shows one million dollars' worth of ore in a single block. The main shaft is to be deepened to 600'. The Holland and Columbus tunnels are connected by a drift-crosscut, on the Braine fissure, giving ventilation, and the Holland tunnel has electric traction.

Machinery plant is actuated by electricity, power being secured from a Pelton wheel, working under a head of 494', water being delivered through 4,500' of 20" and 22" steel pipe, developing 660 h. p., which is transformed into electricity by two 300-kw. dynamos, and carried to the mine by a 4½-mile transmission line. Foundations are in for another wheel of the same size. There are four 25-h. p. hoists, good for 600' each, a 10-drill Nordberg air-compressor and a 5-drill Ingersoll-Sergeant air-compressor. The mine has a machine-shop and sawmill.

A 150-ton concentrator was built from the material secured out of two old 100-ton mills, these being the Tesora mill at Tintic, and the Weber-Kearns mill at Park City. Mill has a Gates gyratory crusher, 2 sets of Rogers rolls, six 3-compartment jigs and 7 Wilfley tables. Concentrates ore shipped, 16 miles, to Murray, for smelting.

The first year's operations, 1905, gave returns of \$281,626, with disbursements of \$251,478, including \$50,000 indebtedness liquidated, and circa \$40,000 expended for buildings and equipment, leaving a net credit balance of \$29,566. The management, which has been rather harshly criticised, has "made good," and the property is one of great promise.

COLUMBUS COPPER CO.

ARIZONA.

Mine office: Clifton, Graham Co., Ariz. C. E. Stevens, superintendent. Is developing by tunnel.

COLUMBUS EXTENSION MINING CO.

UTAH.

Office: care of Anthony O. Jacobson, president and general manager, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Lands, circa 300 acres, near the Columbus Consolidated, having an old 140' tunnel. It is planned to develop by a new tunnel, of circa 6,500' length.

COLUSA-PARROT MINING & SMELTING CO.

MONTANA.

Office and mine: Butte, Silver Bow Co., Montana. Hon. Wm. A. Clark, president; A. H. Wethey, vice-president and general manager; W. M. Bickford, secretary; Fred. Pratt, mill superintendent; David Matthews, smelter superintendent. Organized November, 26, 1897, under laws of Washington, with capitalization \$500,000, shares \$50 par. Has paid dividends, to close of 1905, of \$1,760,000. Property is a concentrating and smelting plant, known as the Butte Reduction Works, on which about \$300,000 has been expended in improvements, 1905-1906.

Concentrator has a daily capacity of 1,000 tons of sulphide ore, putting four into one. Equipment includes one 15x24" Blake crusher; five 9x15" crushers; ten 6' Chilean mills; nine 16x30" Cornish rolls; 62 two-compartment and three-compartment Hartz jigs, and 76 Wilfley tables.

Concentrates, carrying 15% to 20% silica, are calcined in 5 Wethey roasting furnaces and two McDougall calciners. Crude ore fines are mixed

with concentrates, and the roasted product carries 5% to 7% sulphur only. High-grade ore requiring no concentration is desulphurized by kiln-roasting, going thence to blast-furnaces. Smelter equipment includes two 150-ton blast-furnaces and three 80-ton reverberatory matting furnaces, 20x60' in size. Waste gases from the reverberatories are utilized for power purposes. The main dust-chamber, 60' to 80' wide, 30' high and 360' long, has brick walls and sheet steel roof. The smelter has the largest concrete stack ever built, this being 352' 7" high, with a uniform diameter of 18' from top to bottom. Material required for this stack included 60 tons of steel, 1,500 barrels of Portland cement and 1,400 tons of sand. The foundation, 100' square, 3' deep, and weighing 12,800 tons, is made of molten slag, in solid blocks, interlaced with 70 tons of scrap iron and steel, leading from the base into the bottom of the stack. Above the foundation of slag is a solid block of concrete, 42' 6" square, 5' high at the sides and 8' 6" high in the center, with four layers of $1\frac{1}{4} \times 1\frac{1}{4}$ " "T" iron, also 500 bars of the same size "T" steel, radiating in a circle from the chimney opening. The stack was built at the rate of about 30' per week.

The converter plant, for bessemerizing the matte, was put in operation early in 1906. The building is of steel, with two stands and room for a third. Product of the plant, until the completion of the converter, was a matte carrying 55% copper, 75 oz. silver and \$2 gold per ton, which was sent to the Nichols Chemical Works for electrolytic refining. The smelter is being modernized throughout, and the management is capable.

COMANCHE CONSOLIDATED COPPER CO.

NEW MEXICO.

Office: care of Wm. D. Leehey, secretary, Seattle, Wash. Mine office: Fair View, Sierra Co., N. M. J. J. Haggerty, president; P. D. Johnson, vice-president; Marcus Murray, treasurer; preceding officers, Jas. B. Taylor, Mangus McEntosh and J. C. Arkard, directors. Organized 1906. Lands 14 claims, circa 10 miles from Fair View. Company plans doing about 5,000' of diamond drilling, before sinking shafts.

COMANCHE MINING & SMELTING CO.

NEW MEXICO.

Office: 46 Loan & Trust Bldg., Milwaukee, Wis. Mine office: Silver City, Grant Co., N. M. S. S. Curry, president; Geo. J. Lonstorf, vice-president; Chas. J. Laughren, secretary and general manager; Carl Landsee, treasurer; Henry M. Edwards, superintendent; Victor Viderton, mine superintendent. Organized, 1902, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par.

Lands, 38 claims, area 760 acres, including the Burro Mountain and Pinos Altos groups, both in the Burro Mountains, circa 13 miles from Silver City, also sundry orchard and ranch lands. The Burro Mountain group shows 3 lenses, carrying oxide, carbonate and silicate ores, giving average assays of 5% to 8% copper, with only nominal gold and silver values, with indications of sulphides at greater depth, development to date being on a limited scale.

The Pinos Altos mines were considerable producers for some years, under the ownership and management of the late Senator Hearst. The group shows 4 fissure veins, opened by 4 shafts of 400' to 700' depth. The Gillette is the

main working shaft. Ores are cuprite, malachite, azurite and chrysocolla, in the upper workings, with sulphide ores below that give returns of 3% copper, up to 20% zinc, 15 oz. silver and \$7 gold per ton. The Pinos Altos group has large bodies of low-grade ore developed. A 13-mile narrow-gauge railroad connecting the Pinos Altos mines with the smelter was completed early in 1906.

The old reduction plant, at Silver City, burned 1903, has been replaced by more modern works. The plant includes a concentrator with magnetic separators for zinc extraction, about 500 yards west of the rebuilt smelter, which has 5,000-ton ore-bins. The smelter has 3 furnaces. A 75-ton furnace was blown in January, and a second of the same size, March, 1906. The third, a 200-ton blast-furnace, is to be blown in upon completion of the narrow-gauge railway to Pinos Altos. The smelter also does a considerable custom business, product being blister copper averaging 98% copper, 150 oz. silver and 10 oz. gold per ton. In connection with the smelter are a briquetting plant, machine-shop, iron foundry, smithy, electric light plant, office building, and a number of dwellings for employes. The management is experienced and aggressive, and the property is considered promising.

COMMERCE GOLD & SILVER MINING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Duncan, Ariz.

COMODORE COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Wyo.

COMMODORE MINES, LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Vancouver, B. C. Jas. R. Webster, president; H. W. Pegram, secretary. Organized June 20, 1902, under laws of British Columbia, with capitalization \$750,000, shares \$10 par. Lands were on Texada Island.

COMO-EUREKA MINE.**NEVADA.**

Owned by Federal Gold & Copper Co.

COMSTOCK MINE.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Presumably idle.

COMSTOCK MINE.**UTAH.**

Mine office: Park City, Summit Co., Utah. Is said to have ore assaying 10% copper, 5 oz. silver and \$10 gold per ton.

COMSTOCK MINE.**WYOMING.**

Office and mine: Hecla, Laramie Co., Wyo. Is owned by Martha Ferguson and leased by A. H. Lindsey, et al. Has a 150' shaft and 300' tunnel, showing small bunches of chalcocite.

COMSTOCK MINING CO.**WYOMING.**

Letter returned unclaimed from former office and mine, Encampment, Carbon Co., Wyo. Wm. Norell, president and general manager; C. B. Bergquist, secretary. Organized Oct. 1, 1900, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area 103 acres, also a 20-acre millsite, in the Battle Lake district, showing 4 fissure veins, of which two averaging 16' width and giving assays of 15% copper, 20 oz. silver and \$3.15 gold per ton, have been cut by a 250' tunnel.

COMSTOCK & TASMAN LYELL, CONSOLIDATED.**TASMANIA.**

Property is sundry partly prospected mining lands, on the western slope of Mt. Lyell, Montagu county, Tasmania.

COMSTOCK-TREADWELL GROUP.**WASHINGTON.**

Mine office: Orient, Ferry Co., Wash. Alexander Sharp, manager. Lands, sundry claims, 6 miles north of Orient, showing copper ore.

MINAS LAS CONCAVAS.**COSTA RICA**

An old copper property in Costa Rica, opened in the Eighteenth Century, or earlier, reopened, circa 1900, and again idle.

COMPAÑIA MINERA CONCEPCIÓN DEL ORO.**MEXICO.**

Mine office: Concepción del Oro, Zacatecas, Mexico. Santiago Chamberlain, president; J. L. Kowalski, secretary and general manager; Santiago Chamberlain, Jr., superintendent; Juan Sanchez, mining captain. Organized 1902, with capitalization \$30,000, shares \$30 par. Lands, 32 pertenencias, area circa 80 acres, in the Mazapil district. A 4' vein carries oxide ores averaging 30% copper, with gold and silver values. Shaft, 33 metres. Ore is shipped 336 miles, to smelters at San Luis Potosí. Has gasoline power and employed a considerable force, at last accounts.

GEWERKSCHAFT CONCORDIA.**GERMANY.**

Mine office: Herdorf, Rheinprovinz, Germany. Is a very small producer of copper ore.

CONCRETE GOLD MINING CO.**COLORADO.**

Office: 324 Cooper Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Saml. V. Newell, superintendent. Ores carry gold, silver, lead and copper. Has steam power.

CONDON MINE.**ARIZONA.**

Office and mine: care of T. C. Condon, owner, Oracle, Pinal Co., Ariz. Geo. E. Metz, superintendent. Has gasoline power. Presumably idle.

COMPAÑIA MINERA DE CONDORIACO.**CHILE.**

Mine office. La Serena, Coquimbo, Chile. Has steam power and employs about 75 men.

CONEJO-COLORADO MINING CO.**MEXICO.**

Mine office, Ocotlán, Oaxaca, Mex. F. B. Morse, manager. Mine is opened by shafts and tunnel, developing ores carrying gold, silver and copper. Has steam power, 5 stamps, 2 Huntington mills and a 30-ton cyanide plant.

CONFEDERATE MINING CO.**ARIZONA.**

Office: care of Col. Lee Crandall, president, Washington, D. C. Maj. D. W. Crabb, secretary and treasurer; Carl Crandall, manager. Organized Sept. 6, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Property is the Candelaria group, on Reno Mountain, Maricopa county, Arizona, opened by shafts of 30', 60' and 64', said to show a 12' vein of sulphide ore, carrying a 4' paystreak, giving assays of 20% copper.

CONGO MINE.**WYOMING.**

Mine office: Rudefeba, Carbon Co., Wyo. Lands, sundry claims, north of the Ferris-Haggarty mine, opened by an incline shaft and short tunnel, latter showing ores assaying well in copper, silver and gold, with a little nickel.

CONGOR GOLD & COPPER MINING CO.**UTAH.**

Office: 506 Auerbach Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. C. G. Hall, manager. Lands adjoin the Dalton & Lark mine. Idle several years, until unwatered 1905. Is said to be under option to W. H. Tibbals, et al, for \$150,000.

CONGRESS COPPER MINING CO.**COLORADO.**

Mine office: Red Mountain, Ouray Co., Colo. Geo. H. Foltz, manager. Has cupriferous gold and silver ores, opened by shafts and equipped with steam power, employing circa 30 men, at last accounts.

CONGRESS GOLD & COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, Spokane, Wash. Joseph Roslow, president; J. Goodrich, secretary. Lands, circa 80 acres, in the Keller district of Ferry county, Washington. Mine is opened by shafts and tunnels, on 2 veins giving good assay values in gold, silver and copper, with a little nickel. Idle.

E. P. CONNER CO.**CALIFORNIA.**

Office and mine: Redding, Shasta Co., Cal. Mining property idle.

CONQUEST CONSOLIDATED MINING CO.**WASHINGTON.**

Office: 426 Postal Telegraph Bldg., New York. Mine office: Newport, Stevens Co., Wash. John H. Shaw, president; J. W. Hays, secretary. Is a consolidation of the Conquest Gold & Copper Mining & Milling Co., and the American Eagle Mining & Milling Co. Lands, 12 claims, showing 3 veins of 4' to 8' width, opened by about 2,200' of tunnels. Ore of good average grade has been uncovered in fair quantities, and considerable ore is blocked out for stoping. Has a good equipment, including steam power and air-compressors. Property considered promising. Idle.

CONQUEST GOLD & COPPER MINING & MILLING CO.**WASHINGTON.**

Reorganized, circa 1902, as Conquest Consolidated Mining Co.

CONRAD CONSOLIDATED MINE.**AUSTRALIA.**

Mine office: Howell, New South Wales, Australia. Ores are said to be argentiferous sulphides of copper, lead and tin—an unusual combination.

CONSERVATIVE MINING CO.**WASHINGTON.**

Office: Snohomish, Wash. Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Frank M. Evans, president; Hugh Kennedy, secretary and manager. Organized under laws of Washington, with capitalization \$200,000, shares 20 cents par. Lands, 10 claims, known as the St. Louis group, 3 miles from Silverton, said by company to show a 15' vein—which is called by others a vein of 18" to 36" width—carrying argentiferous and auriferous chalcopryrite, assaying up to 20% copper. Idle.

CONSOLIDATED AFRICAN COPPER**RHODESIA & MOZAMBIQUE.****TRUST, LTD.**

Offices: 8, Old Jewry, London, E. C., Eng. Mine office: Bulawayo, Rhodesia, South Africa. Dr. Hans Sauer, chairman; Consolidated Goldfields of South Africa, Ltd., secretary; Cyril E. Brackenbury, general manager. Organized Feb. 17, 1902, with capitalization £600,000, shares £1 par; issued, £184,000. Lands, 1,790 claims, including 135 claims in the Lomagunda

district, 900 in the Victoria district, 30 in the Kafue district, 20 in the Umtali district, 70 in the Tuli district, Mashonaland, 60 in Bechuanaland, 202 in Mozambique, and sundry miscellaneous holdings and rights, including coal lands, in which a half interest in two tracts is to be sold to the North Zambesi Coal Syndicate. Principal copper mining properties are the Alaska, Edmundian and Umkondo.

The Alaska mine, 90 miles northwest of Salisbury, shows the second largest ancient workings in Rhodesia, ore bodies having an estimated average width of 150' and length of 1,700', which figures probably are subject to revision. Copper ore has been found at a depth of 200' to 800' in numerous diamond drill borings, and company estimates that 150,000 tons of cupriferous schists, showing 3% copper, are exposed above the water level. The mine is idle, but the Salisbury-Lomagunda railroad is expected to be extended to within 13 miles of this property.

The Edmundian mine, in Mozambique, has 7 levels and has shipped 2,377 tons of 20% copper ore to England, for test smelting. The property is small, but apparently good.

The Umkondo mine, in the Victoria district, gives indications of making a large property. The tract has been been diamond drilled extensively, drill-cores giving average assays of above 9% copper. Several shafts have been sunk, showing 2 veins, with oxides above and sulphides below, and the company estimates that 43,470 long tons of ore, averaging 8.5% copper, are in sight. On Sept. 30, 1905, the company had 12,160' of openings in its various mines. Management is good and property is considered promising.

CONSOLIDATED COPPER CO.

BRITISH COLUMBIA.

Dead. Former offices were Minneapolis, Minn., and Ainsworth, B. C.

CONSOLIDATED COPPER CO.

OREGON.

Office: Anderson, Ind. Mine office: Homestead, Baker Co., Ore. Organized Sept. 25, 1905, under laws of Oregon, with capitalization \$2,500,000, shares \$10 par, by Wm. Robertson, Wm. Garretson and A. E. Johnson, to develop copper claims on the Snake river, near Homestead.

CONSOLIDATED COPPER CO., LTD.

CORSICA & MEXICO.

Offices: Dashwood House, London, E. C., Eng. F. Hawdon, chairman; S. J. Crouch, secretary; Thos. P. Rowe, manager. Organized June 10, 1899, as a reconstruction of the New Consolidated Mining Co., Ltd., with capitalization £100,000, shares 10s. par, 9s. 6d. paid in. Lands include La Bufa de Charcas and sundry adjoining claims, carrying copper, silver and lead ores, in the state of San Luis Potosí, Mexico, also the Lacone copper mines, in Corsica, idle for some years.

CONSOLIDATED COPPER CO. OF PARRY SOUND.

ONTARIO.

Office: Duluth, Minn. Lands, sundry claims in the Parry Sound district of Ontario, including former holdings of the Hattie Belle Gold, Copper & Nickel Co. Is asserted to have 4,000,000 tons of ore in sight, claimed to carry net values of \$10 to \$15 per ton, which, of course, is not true. Idle.

CONSOLIDATED COPPER CO. OF VIRGINIA.

Office: 5 Beekman St., New York. Franklin Bien, president; Edw. T.

Coyne, vice-president; Jos. B. Bissell, treasurer; Nathan E. Clark, secretary. Organized October, 1902, under laws of South Dakota, with capitalization \$100,000,000. Presumably abortive.

CONSOLIDATED COPPER MINING CO.

IDAHO.

Succeeded, circa 1904, by Ladd Metals Co.

CONSOLIDATED COPPER MINING, MILLING & SMELTING CO.

COLORADO.

Office: 417 Temple Court, Denver, Colo. Mine office: Eldora, Boulder Co., Colo. J. B. Johnson, president and general manager; C. M. Hunt, vice-president; E. W. Kelley, secretary; W. W. Jones, treasurer; H. T. Coates, superintendent. Organized Oct. 21, 1899, under laws of Colorado, with capitalization \$3,000,000, shares \$1 par. Annual meeting, second Tuesday in September. Lands, 18 claims, partly patented, area circa 150 acres, also sundry miscellaneous lands, giving total holdings of 350 acres, in the Grand Island district, showing 4 contact veins between granite and phonolite, of which one, under development, averages about 7' width and is opened by 3 shafts, deepest 360', and the 2,410' Fourth of July tunnel, showing chalcocite, bornite and chalcopryite returning average assays of 15% copper, 15% lead, 40 oz. silver and \$20 gold per ton. Has steam power and 6-drill Leyner 2-stage air-compressor, with necessary mine buildings. Company plans continuing development.

CONSOLIDATED FLAGSTAFF MINING CO.

UTAH.

Office: care of Philip D. Durant, secretary, Milwaukee, Wis. Mine office: Alta, Salt Lake Co., Utah. Thos. J. Pringle, president; John A. Kirby, vice-president and general manager; Kenneth W. Jacobs, treasurer; Wm. M. Wantland, assistant manager. Organized circa 1906, with capitalization \$2,000,000, shares \$25 par. Lands, 235 acres, including the Old Flagstaff mine, once a considerable producer, adjoining the Columbus, Consolidated. Management plans running a 2,400' tunnel, and raising from the end to connect with the Old Flagstaff workings.

CONSOLIDATED GEM MINES CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. W. S. Renshaw, manager. Ores carry gold, silver, lead and copper. Has steam power and a 10-stamp mill.

CONSOLIDATED GOLD & COPPER CO.

ARIZONA.

Dead. A Douglas-Lacey swindle. See Amalgamated Gold & Copper Co.

CONSOLIDATED GOLD & COPPER CO.

MEXICO.

Office: 813½ Chestnut St., St. Louis, Mo. Mine office: La Cananea, Sonora, Mex. H. M. Whitney, president and general manager. Organized under laws of District of Columbia, with capitalization \$1,000,000. Lands, 1,729 acres, including the Chapultepec mine, area 988 acres, and the Corregidor mine, area 741 acres, adjoining properties lying about 6 miles southwest of Cananea, said to show a geological formation similar to that of the Capote mines of the Greene Consolidated.

CONSOLIDATED GOLD, COPPER & COAL CO. COLORADO & WYOMING.

Office: Encampment, Wyo. J. E. Hedding, president; J. W. Hedding, secretary. Lands include 2 copper claims, area 40 acres, near Pearl, Larimer

county, Colorado; 6 gold claims, known as El Rey gold mine, area 98 acres, and 3,595 acres of coal lands, circa 15 miles from Walden, Larimer county, Colorado. Latter tract is said to show a 65' vein of coal, which could be developed by stripping. Coal lands are remote from transportation, but probably can be made valuable eventually. Idle.

CONSOLIDATED GOLD & COPPER MINING CO.

UTAH.

Office: 25 Broad St., New York. Letter returned unclaimed from former mine office, La Sal, Grand Co., Utah. A. Graham Donnelly, president; Gid R. Propper, superintendent. Capitalization, \$20,000,000. Claims also to have lands in Utah, Montana, Colorado and Oregon. Is grossly overcapitalized, idle, and presumably moribund.

CONSOLIDATED GOLD & COPPER MINING & MILLING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Chas. W. Freeman, president; Andrew R. Olson, secretary. Lands, sundry claims, not generally considered to be well located.

CONSOLIDATED GREEN MOUNTAIN

BRITISH COLUMBIA.

ST. LOUIS MINES, LTD.

Office: care of Chas. D. Clark, treasurer, Peoria, Ills. Mine office: Rossland, Yale district, B. C. W. L. Lowry, president. Capitalization \$3,000,000, shares \$1 par. Has a 400' shaft. Idle for several years.

CONSOLIDATED JEFFERSON GOLD & COPPER MINING CO.

UTAH.

Office: 221 Atlas Blk., Salt Lake City, Utah. Nicholas Schmittroth, president; H. A. Nieman, vice-president and assistant manager; T. W. Butler, secretary; Frank Rumel, treasurer. Organized June, 1902, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Lands, sundry claims in the Big Cottonwood district, Salt Lake county, Utah.

CONSOLIDATED KING DEVELOPMENT & COLUMBIA

ARIZONA.

COPPER MINING CO.

Office and mine: Jerome, Yavapai Co., Ariz. Geo. W. Hull, president; H. E. Wilcox, secretary. Organized under laws of Arizona, with capitalization \$6,000,000, shares \$1 par. Lands, 34 claims, area 400 acres, in the Verde district, adjoining the United Verde on the south and east, showing several ore bodies carrying oxide, carbonate and sulphide ores, giving fair assay values in copper, gold and silver. Development is by a 400' shaft and several tunnels, longest 1,750'. About \$250,000 has been expended on the property, which has gasoline power. Management is said to plan installation of a reduction plant, during 1906.

CONSOLIDATED LA SAL MINING & SMELTING CO.

COLORADO.

Office: North American Bldg., Philadelphia, Pa. Mine office: Cashin, Montrose Co., Colo. James N. McBride, general manager. Is a reorganization of the La Sal Copper Mining Co., which produced 270,000 oz. silver and 224 tons fine copper, valued at \$212,286.69, after paying smelting charges, and from which dividends of \$24,000 were paid. Lands, 10 claims, area 150 acres, opened by one shaft and 3 tunnels, having about 5,000' of underground openings, on a 5' vein claimed to average about 8% copper, and up to 134 oz. silver, with small gold values. Has steam and water power, leaching

plant and a small smelter. Property regarded as promising. Presumably idle.

CONSOLIDATED MERCUR GOLD MINES CO. UTAH.

Office: P. O. Box C, Salt Lake City, Utah. Mine office: Mercur, Tooele Co., Utah. John Dern, president; Wm. M. Thompson, secretary; Geo. H. Dern, treasurer and general manager. This is one of the leading gold mines of the United States, and is a producer of the precious metals only at present, but has at its mills tailings carrying thousands of tons of copper, which eventually should be recovered, to a considerable extent.

CONSOLIDATED MINES & DEVELOPMENT CO. ARIZONA.

Mine office: Globe, Gila Co., Ariz. Organized 1905, with capitalization \$500,000, shares \$1 par. Lands, 8 claims, at the head of Arkansas Gulch, 7 miles west of Globe, from which diamond drill cores have shown 6% ore, apparently from stringers in the ledge. A 45' shaft is said to be bottomed in solid sulphide ore.

CONSOLIDATED MINING & SMELTING CO. NEW MEXICO.

Mine office: Cerillos, Santa Fé Co., N. M. R. B. Thomas, manager; J. L. Wells, superintendent. Ores carry gold, silver, lead, copper and zinc. Company works the Tom Paine, Albany and other mines. Property is extensively developed, well equipped with gasoline and electric power, and employs 100 men or upwards. Has a 120-ton lead smelter, and secures a trifling amount of copper as a by-product.

CONSOLIDATED MINING & SMELTING CO. UTAH.

Dead. Formerly had lands at Brigham, Box Elder Co., Utah.

**CONSOLIDATED MINING & SMELTING CO. BRITISH COLUMBIA.
OF CANADA, LTD.**

Operating office: Trail, Yale district, B. C. W. D. Matthews, president; Geo. Sumner, vice-president; W. H. Aldridge, managing director; preceding officers, E. B. Osler, H. S. Osler, W. L. Matthews and Chas. R. Hosmer, directors. Organized, 1905, as Canadian Consolidated Mines, Ltd., and name changed, circa February, 1906, to present title, by supplementary letters patent. Capitalization \$5,500,000, shares \$100 par; issued, \$4,698,888. First quarterly dividend, of 2.5%, was paid April, 1906. Is a securities' holding corporation, controlling, through stock ownership, the Centre Star Consolidated Mining Co., War Eagle Consolidated Mining & Development Co., Ltd., St. Eugene Consolidated Mining Co., Ltd., Canadian Smelting Works and Rossland Power Co., all of which are separately described, under their respective titles.

CONSTELLATION GOLD MINES CO. OREGON.

Mine office: Sumpter, Baker Co., Ore. J. Higgins, superintendent, at last accounts. Ores carry gold, silver, lead and copper.

CONSOLIDATED NICKEL, TIN & COPPER MINES, LTD.

Offices: 50, Fenchurch St., London, E. C., Eng. W. T. Strong, secretary. Organized March 21, 1903, under laws of Guernsey, with capitalization £60,000, shares £1 par; issued, £58,480.

CONSOLIDATED STANLEY MINING & MILLING CO. COLORADO.

Office: Jacksonville, Illa. Mine office: Idaho Springs, Clear Creek Co.,

Colo. John M. Jackson, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, and a 10-stamp mill, employing circa 40 men, at last accounts.

**CONSOLIDATED UNITED VERDE JUNIOR ARIZONA & COLORADO.
MINING CORPORATION.**

Office: Old Orchard, Me. Letter returned unclaimed from former mine office, Jerome, Yavapai Co., Ariz. Daniel L. Dean, president; F. A. Sidelinger, secretary and treasurer. Capitalization \$2,000,000, shares \$1 par. Has lands in Gilpin county, Colorado and is supposed to have, or to have had, lands in Yavapai county, Arizona, showing oxide and carbonate ores that have given assays of 34% to 53% copper and \$6 to \$29 gold per ton.

CONSTELLATION MINE. ARIZONA.

Mine office: care of Wm. F. Roberts, owner, Briggs, Yavapai Co., Ariz. Has auriferous copper ores. Presumably idle.

CONSTANTINE COPPER MINING CO. WYOMING.

Office: 76 East Third St., Winona, Minn. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. W. H. Elmer, president, John Tonsley, secretary; Earle R. Clemens, treasurer. Organized November, 1903, under laws of Wyoming, with capitalization \$250,000, shares \$1 par; in 150,000 shares preferred and 100,000 shares common stock. Lands, 3 claims, area 60 acres, opened by a 22' shaft and a 60' tunnel.

CONSTELLATION CONSOLIDATED COPPER MINES. CALIFORNIA.

Mine office: Campo Seco, Calaveras Co., Cal. E. J. Berger, superintendent, at last accounts. Has steam power.

CONSTITUTION MINE. BRITISH COLUMBIA.

Mine office: New Alberni, Vancouver Island, B. C. Lands, $\frac{1}{4}$ mile from tidewater, on Coos Creek, about 3 miles from New Alberni, show gold-copper ore, in a 140' tunnel. Presumably idle.

MINA CONSUELO. MEXICO.

Office: care of Dr. A. F. Gavilan, owner, Durango, Mex. Letter returned unclaimed from former mine office, Yerbániz, Durango, Mex. Ores carry copper, silver, gold and lead.

CONSUMNES MINE. CALIFORNIA.

Owned by Rio Vista Gold & Copper Mining Co.

CONTACT GROUP. ARIZONA.

Office: care of A. A. Patterson, owner, Globe, Gila Co., Ariz. A group of 7 claims, near the Bobtail mine, circa 15 miles from Globe.

CONTENTION MINING CO. COLORADO.

Mine office: Silverton, San Juan Co., Colo. G. E. Collins, manager, at last accounts. Ores carry gold, silver and copper values. Has steam and water power.

CONTINENTAL ALTA MINES. UTAH.

Owned by the Continental Mines & Smelting Corporation.

CONTINENTAL CONSOLIDATED MINING CO.

Office: care of Ben Blanchard, manager, Mayer, Ariz. Lands, sundry claims, presumably in Yuma county, California, but possibly in San Bernar-

dino county, California, near the proposed line of the new Arizona & California railroad.

CONTINENTAL COPPER CO.**MEXICO.**

Office: care of City Brewery, San Antonio, Texas. Mine office: Panuco de Monclova, Coahuila, Mex. Otto Koehler, president; A. L. Tuttle, general superintendent; Arthur H. Luck, mine superintendent. Organized circa 1905, with capitalization \$150,000. Ownership and management are practically the same as that of the Jimulco Mining Co.

Property bought, circa 1905, of the Panuco Copper Co., Ltd., includes extensive mines at Panuco and Romero Rubio, Coahuila, Mexico. The Panuco is an old property, opened circa A. D. 1700, and worked at intervals since, the aggregate production having been very considerable. The Panuco Copper Co., Ltd., previous owner, was organized 1898, and in seven short years suffered strange mutations of fortune, which went from bad to worse. The ores, as worked, are said to give average returns of about 6% copper. The failure of the Panuco company affords no criterion by which to judge the value of the property, as that corporation was mismanaged, to put the case mildly.

Present owners, who are energetic and wealthy, are going about the work of rejuvenation in a business-like manner. Operations being costly, because of rail connections, it has been decided to build a 75-kilometer narrow-gauge railway, connecting Panuco with one of the Mexican trunk lines, and rails and 3 locomotives, one of the cog-wheel type, have been bought for the line.

A concession has been secured from the state legislature of Coahuila for a smelter at Monclova, and a 300-ton plant is to be constructed. Part of the smelting plant of the Descubridora Copper Co., has been bought for this purpose, and will be removed to Monclova from Descubridora, Durango, Mexico. Under the present energetic management, the Panuco, which, in 1902, made only 665 tons fine copper, may become an important producer.

CONTINENTAL COPPER CO.**SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Hill City, Pennington Co., S. D. Samuel A. Baxter, president; H. A. Holdridge, vice-president; W. J. Booth, secretary; Wm. F. Neuman, treasurer. Organized 1904, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par. Is a holding company only, property consisting of a two-thirds stock interest in the Dakota-Calumet Co., which is idle. Had some sort of an interest in the Maloney-Blue Lead Copper Mining Co., but apparently has lost it.

CONTINENTAL COPPER CO.**WYOMING.**

Office: Colorado Springs, Colo. John M. Harran, president; J. W. Wallwork, secretary. Lands, sundry claims in vicinity of Battle, Carbon county, Wyoming. Presumably idle.

CONTINENTAL COPPER MINING CO.**WYOMING.**

Mine office: Battle, Carbon Co., Wyo. J. T. Brown, superintendent, at last accounts. Property is in the Cow Creek district, and is said to show a large body of low-grade ore. Has a 6x8" hoist and a 25-h. p. boiler. Idle at last accounts.

CONTINENTAL COPPER SYNDICATE, LTD.

Offices: 70, Cornhill, London, E. C., Eng. Organized September 28, 1905, with capitalization £500; shares, 1s. par. Floated the Mitterberg Copper Co., Ltd., receiving in payment cash and £50,000 in shares of latter-named corporation.

CONTINENTAL GOLD MINING CO.**OREGON**

Mine office: Nugget, Douglas Co., Ore. W. B. Stewart, president and general manager. Ore is an auriferous iron-copper sulphide, with values principally in gold. Is said to be building a 50-ton concentrator.

CONTINENTAL MINES & SMELTING CORPORATION.**UTAH.**

Offices: 90 Wall St., New York, and 409 Dooly Bldg., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs circa 100 men. Henry M. Crowther, president and general manager; Horace E. Parker, vice-president; G. C. Van Alstyne, secretary and treasurer; R. S. Smith, superintendent. Organized July, 1903, under laws of New York, with capitalization \$1,500,000, shares \$10 par. Empire State Trust Co., New York, registrar. Lands, 30 claims, area 460 acres, about half patented, also a 20-acre millsite, in the Little Cottonwood district. Country rocks are limestone, porphyry, granite, and quartzite, said to show about 20 contact veins, between limestone and porphyry, of 1' to 40' width, giving assays of 2% to 35% copper, 10% to 48% lead, 7.5% zinc, 15 oz. to 120 oz. silver and 60c. to \$5 gold per ton, from malachite, azurite and oxide ores of copper, galena, sphalerite, etc., estimated to carry average values of about \$25 per ton. Has 5 shafts, deepest 200', and 9 tunnels, of 300' to 2,000', with total underground openings of circa 18,000', estimated by company to show 742,000 tons of ore, with 242,000 tons blocked out for stoping.

Present company holds lands formerly held by the Lavinia, Grizzly Consolidated, Darlington, and Regular mining companies, which are said to have produced upwards of \$1,000,000 in ore. Mines were first opened, circa 1864, and were idle, 1892 to 1899.

A 5-mile Riblet aerial tramway was nearly completed, at end of 1905. This is a costly, but essential improvement, as the road was very bad and frequently impeded by snow-slides, while freight rates were \$1.75 per ton on outgoing ore, and \$5 per ton on ingoing fuel and supplies. The property also has a 100-ton concentrator, and production was begun 1905. At close of year mill was treating about 100 tons of ore daily, putting four into ore and turning out about 25 tons of concentrates, said to be carrying about 40% lead and 15 oz. silver per ton. Some of the company's ores carry tungsten and molybdenum. Power is furnished by water from Little Cottonwood Creek, actuating a direct-connected Pelton wheel.

Company paid to end of 1905, eleven 2% dividends on issued treasury stock, amounting to \$24,000, and these payments cannot be justified on sound financial principles. The property, however, seems to be valuable, and the management apparently is endeavoring honestly, and with a considerable degree of success, to put the property on a sound productive basis.

CONTINENTAL MINING CO.**WYOMING.**

Office: 20 Metropolitan Opera House Bldg., St. Paul, Minn. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. A. L. Cox, president; A. Messer, vice-president; Ker D. Dunlop, secretary and treasurer. Organized November, 1898, under laws of Wyoming, with capitalization \$800,000, shares \$1 par. Lands, 7 claims, 6 patented, area 125 acres, also a 20-acre millsite, in the Battle Creek district, carrying several fissure veins, of which two, opened by tunnels of 105' and 820', show a vein of 15' estimated average width, giving average assays of 13.5% copper, 4.3 oz. silver and \$5 gold per ton. Mine is served by the Southern Wyoming tramway of the Penn-Wyoming Copper Co., the third power station being located on the Continental property. Company hopes to continue development during 1906.

CONTINENTAL SMELTING & REFINING CO.**COLORADO.**

Office: Albany Hotel, Denver, Colorado. Mine office: Ironton, Ouray county, Colorado. E. S. Andrews, president; G. J. Butcher, vice-president; W. J. Sawyer, secretary and general manager; E. W. Averill, treasurer; preceding officers, W. W. Tuxbury, H. A. Thompson and Dr. Jas. A. Morrow, directors; Joseph Irving, smelter superintendent; G. H. Richardson, engineer. Organized 1903, under laws of Colorado, with capitalization \$500,000, shares \$1 par; issued, \$300,000. Lands, 14 claims, area 125 acres, in the Red Mountain district, showing sundry fissure and contact veins, of which one, under development, averages 1' to 7' width, showing melanconite, chalcoppyrite, enargite, sphalerite and galena, giving assays of 1% to 30% copper, from nothing to 72 oz. lead, from nothing to 4% zinc, from 2 oz. to 1,500 oz. silver and from \$1 to \$20 gold per ton. Development is by shafts of 70' and 92' and by tunnels of 60', 75', 500', 500', 700' and 1,000', with a total of 5,985' of underground openings, estimated to show 75,000 tons of oxidized ores and 150,000 tons of sulphide ores. Mine has a 100-h. p. steam plant and electric motors. Buildings include necessary shops, office, bunkhouses, and a smelter having two 100-ton water-jacket blast-furnaces, planned to turn out matte averaging about 30% copper, 150 oz. to 400 oz. silver and 1 oz. to 5 oz. gold per ton. Property is served by the Red Mountain & Silverton railroad. Company plans to continue development work, and hopes to blow in the new smelter about July 1, 1906. Management seems businesslike, and property is regarded as promising.

COONEY HILL GOLD & COPPER MINING & MILLING CO.**WYOMING.**

Office: Cheyenne, Wyo. John Brown, secretary. Lands supposedly are in the Encampment district of Carbon county, Wyoming.

COONEY MINE.**NEW MEXICO.**

Owned by Mogollon Gold & Copper Co.

CO-OPERATIVE MINING CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Berlin, Wash.

CO-OPERATIVE MINING & MILLING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment,

Carbon Co., Wyo. S. E. Phelps, secretary. Had a shaft on a fissure vein, carrying iron oxides and traversing schists and quartzite.

COPAQUIRE COPPER SULPHATE CO., LTD.

CHILE.

Offices: 101, Leadenhall St., London, E. C., Eng. Mine office: Casilla 266, Iquique, Tarapacá, Chile. Employs 20 men, in prospecting work. J. E. G. Hadath secretary; Richard Stanton, general manager; J. E. Gillmore, clerk. Organized May 19, 1900, with capitalization £494,000, shares £1 par; issued, £289,082.

Lands, 25 claims, area probably 25 hectareas, in two groups. The Huiquintipa group of 13 claims, at Huatacondo, Copaquire, Tarapacá, Chile, carries diopside and chrysocolla, these silicates of copper occurring as the cementing material in a conglomerate stratum ranging up to 85' thickness. Estimated average copper tenor of these silicates is 3.25 %, and it is estimated that 6,000,000 long tons of ore are exposed.

The Copaquire group, which was the original property of the company, shows granite as the country rock, carrying irregular deposits of natural copper sulphate. The management of the company always has stated that the deposits were natural bluestone, with some impurities mechanically mixed therewith, but, as a matter of fact, the ore deposits consist of a mixture of three different salts that are very difficult of separation. Company's "experts" have estimated that the Copaquire deposits show upwards of 100,000,000 long tons of ore, worth £20,000,000. Development is by a 150' shaft and about 1,000' of open-cuts and trenches. Equipment includes a 45-h. p. steam plant, warehouse, office and laboratory, of stone, to withstand numerous and severe earthquake shocks. The lixiviation plant, covering about one acre, is rated at 500 tons daily capacity, with a dehydrator for drying crystals of bluestone. Mine and leachery are connected by a 4,000' tramline. Nearest railway is 70 miles distant, transport between being on the backs of mules, over rough mountain roads. Soft coal costs £8 15s. per ton, delivered, and this price being prohibitive, yareta is burned mainly, for fuel. This is a gigantic club-moss, having a lob of resin. Occasionally a single cluster weighs upwards of a ton.

The company closed 1905 about £30,000 in debt. Reorganization was proposed, but this was voted down by the shareholders, at a meeting held October, 1905, and occasioned the resignation of Maj. L. Campbell-Johnston, formerly chairman. Reorganization or liquidation seems inevitable. The troubles of the company seem due to inexperience and underestimating the cost of the undertaking, rather than to downright incompetence or evil intent. The property is not without merit, but the undertaking must be amply supplied with funds and technical skill, before it can be rendered successful.

COPETE CONSOLIDATED COPPER CO.

MEXICO.

Office: 27 William St., New York. Mine office: El Copete, Sonora, Mex. Walter S. Logan, president; Col. Britton Davis, vice-president and managing director; Myra B. Martin, secretary and treasurer; preceding officers, Hollister Logan and Prof. Geo. A. Treadwell.

directors. Organized 1906, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par, to finance the Copete Mining Co., under contract, and is to have one-half the net earnings therefrom. Is practically an underwriting corporation for the Copete Mining Co., which became financially debilitated.

COPETE MINING CO.

MEXICO.

Office: 27 William St., New York. Mine office: El Copete, Sonora, Mexico. Walter S. Logan, president; Myra B. Martin, secretary; Chas. F. Spraker, general manager. Organized 1900, under laws of West Virginia, with capitalization \$5,000,000, shares \$5 par. Lands, circa 350 acres, showing 3 parallel veins, with strong gossan outcrops. Property was operated as a gold mine, early in the Nineteenth Century. Deepest shaft, 600', with about one-half mile of underground openings. Zone of base ores has not yet been reached, apparently no sulphide ore being in sight. Prof. Geo. A. Treadwell, the sponsor and first president of this company, claimed, in 1900, to have found 10,000 tons of ore averaging 10% copper and \$10 to \$60 gold per ton, on the dumps, ready for smelting, and "no trouble to get millions of tons of similar ore." It seems rather remarkable that this large amount of ore on the dumps ran the smelter only two months, producing upwards of \$100,000 in values, but using up the rich carbonates and oxides, and causing the smelter to suspend work. Smelter has 200 tons daily capacity, with 4 miles of pipeline for water. Wm. Melczer and Jas. J. Hardwick, of California, former owners of the property, fell out with the present management, and sold their stock at the best prices obtainable. The company, being unable to sell any more stock, organized the Copete Consolidated Copper Co., to furnish further funds and to receive one-half the profits of the Copete Mining Co. Operation of the property is hampered by the Yaqui Indian uprising.

Company has advertised that Prof. Robt. T. Hill, of the United States Geological Survey, has endorsed the property, but Prof. Hill emphatically disclaims endorsing the management. The company claims that the gold values will cover the cost of gold mining and reduction, leaving the copper cost-free, which, of course, is untrue. Management has been guilty of many misrepresentations in peddling the stock of this company, and, while the property is considered valuable, the management is regarded with well-founded suspicion.

COPETE & MELCZER MINING CO.

MEXICO.

Succeeded, circa 1900, by Copete Mining Co.

COPETE MINES.

MEXICO.

Now held by Copete Mining Co.

COPIAPO MINING CO., LTD.

CHILE.

Offices: 138, Leadenhall St., London, E. C., Eng. Mine office: Copiapó, Atacama, Chile. Ludwig Loeffler, chairman; W. T. Holberton, mine manager; W. S. Bartlett, secretary. Organized June 21, 1836, and capitalization increased, March, 1899, to £250,000, shares £2 par; issued, £225,000. Last dividend, 1903, was 1s., 6d.

Lands include groups of mines at Copiapó and Puquios, also a half-interest in the Republicana mine and a large estate near Copiapó. This was one of the first, if not the very first, of the British copper mining companies to operate in Chile.

The Dulcinea mine, at Puquios, was opened 1854, and long has been a considerable producer. The Fletcher shaft is 2,760' in depth, and is to be deepened. The Weir shaft is 1,800'. Ores are oxides and carbonates, to a depth of about 600', succeeded by sulphides. Ores ranged from 5% to 25% copper tenor, with an average of 14.8%, for the fiscal year 1905. Upper levels have a vein up to 25' in width. The lower workings are very hot, and in 1905 the property suffered from a serious mine fire, that shook down soot and sulphur, which ignited from the heat. Ore reserves to the 450-fathom level are poor, but the showing below the 480-fathom level is better, the south drift on this level showing a 3' vein of 15% ore. Production of the Dulcinea decreased in the fiscal year 1905, owing both to damage from the fire and to decreased values and lessened ore reserves. The Dulcinea has an aerial tram.

The Descubridora mine, in the Checo district, opened 1825, was the company's original mine. Main shaft is about 2,700' deep, and the property was the principal producer of the company until recently, but in 1905 raised only 658 long tons of ore, compared with 10,160 metric tons in 1903.

The Ojancos group, taking its name from the district of its location, includes the Carmen Alto, San Francisco and Antonia. As a whole the Ojancos properties have proven disappointing, but are by no means devoid of promise of future betterment. The Carmen Alto has a 400' main shaft, which is being deepened, and a pump of 60,000 gallons daily capacity is being installed to handle the water, which has proven somewhat troublesome latterly. The mine was looking fairly well at the close of 1905.

The San Francisco has a 350' main shaft, which is being deepened. Ore taken from this mine, during the fiscal year 1905, gave average returns of 16% copper.

The Antonia mine is as yet in the development stage. The Republicana was idle during 1905, and was showing poorly when closed down.

The company has a concentrating mill, but this has not given satisfactory work, the tailings losses being unduly heavy. The works include an extensive lixiviation plant, at Puquios. Production of the company was 3,131,520 lbs. fine copper in 1904, and 2,515,520 lbs. in 1905.

COPPER AGE MINING & SMELTING CO.

WYOMING.

Mine office: Battle, Carbon Co., Wyo. Lands, 12 claims, circa 2 miles north of Battle, opened by the 300' Copper Blossom shaft, sunk on a quartz vein showing little ore at and near surface, but which is said to give a good showing of concentrating ore below 200' depth.

COPPER BAR MINING CO.

NEW MEXICO.

Office: 135 Adams St., Chicago, Ills. Mine office: Organ, Donna Ana Co. N. M. E. Percy Warner, president; Henry Stephens, secretary and treasurer; C. N. Anthony, superintendent. Organized 1900, with capitaliza-

tion \$1,000,000, shares \$1 par. Lands, 8 unpatented claims, area 150 acres, in the Organ Mountains, showing two lenses, said to be contacts between limestone and porphyry, carrying chrysocolla and carbonate ores, said to average 14% copper, with small gold and silver values, opened by shafts of 112', 132' and 177'. Idle.

COPPER BAR MINING CO.**WYOMING.**

Office: care of W. J. Crane, president and general manager, Arlington, Neb. Lands include the company's own holdings on Cow Creek, also the Charter Oak property of 14 claims, 5 patented, lying 8 miles north of Encampment, held under bond and lease, 1905, from the Charter Oak Copper Mines, Ltd. Operations are confined to the Charter Oak group, which has a 488' shaft, with 750' of underground openings. Former development was misdirected, shaft having been sunk at right angles to the vein. The Charter Oak property is said to show sulphide ores averaging 12% copper, several ounces silver and \$6 gold per ton, and to have upwards of 300,000 tons of low-grade ore blocked out, which seems excessive. Vein carries oxides and carbonates above and sulphides below, and has a schistose gangue. Property has steam power and management plans erecting a concentrator and smelter, when rail connections are secured.

COPPER BASIN GOLD & COPPER MINING CO.**ARIZONA.**

Office and mine: 42 Bank of Arizona Bldg., Prescott, Yavapai Co., Ariz., Alfred B. Noxon, president and secretary. W. W. Munds, superintendent. Capitalization \$1,000,000, shares \$1 par. Lands, 17 claims. Has a 140' shaft, and has secured good assay values from auriferous and argentiferous copper ores. Has steam power. Apparently moribund.

COPPER BASIN MINING CO.

Has lands on the Colorado river, near the Bill Williams Fork river, presumably in Yuma county, Arizona, but possibly in San Bernardino county, California, and, late in 1905, planned combining with other companies in the vicinity to secure the erection of a custom smelter, on Empire Flats.

COPPER BASIN MINING CO.**COLORADO.**

Office: care of B. B. Harlan, president, Chicago, Ill. mine office: Placerville, San Miguel Co., Colo. Milton Evans, superintendent. Lands, 15 claims, opened by shaft. A carload of ore shipped to smelter returned 14% copper and \$2.50 gold per ton. Presumably idle.

COPPER BELL MILL & MINING CO.**MONTANA.**

Dead. Property at Clinton, Missoula county, Montana, was sold by the sheriff, January 10, 1905.

COPPER BELL MINE.**WASHINGTON.**

Owned by Bunker Hill-Sullivan Mining & Smelting Co.

COPPER BELLE MINING CO.**ARIZONA.**

Office: 43 Wooster St., New York. Mine office: Gleeson, Cochise Co., Arizona. Peter Quinn, president; Elie J. Moneuse, treasurer; preceding officers, Henry J. Mayer, Frank H. Hereford and George E. Crawford, directors; J. G. Hately, superintendent. Organized 1901, under laws of Ari-

zona, with capitalization \$1,000,000, as reconstruction of a company of the same name, which became bankrupt, circa 1903, under suspicious circumstances. None of present directors, except Crawford, were connected with former company. Lands, 8 claims, in the Turquoise district, having a 3-compartment shaft, 200' deep at end of 1905, and sinking, which it is planned to deepen to 600'. Ores average about 7% copper, with fair gold and silver values. Has a 50-ton smelter, built by the old management, and produces matte of about 30% copper tenor, which is sent to the Old Dominion smelter for refining. Management pursues the mistaken policy of refusing to impart any information regarding company's affairs, but presumably is better than the old management, which caused scandals and wrecked the company. Production, 1905, is estimated at 600,000 lbs. fine copper.

COPPER BELT MINING CO.**MONTANA.**

Lands, sundry claims in the Wallace district, Missoula county, Montana.

COPPER BELT MINING CO.**UTAH.**

Office and mine: Marysvale, Piute Co., Utah. Saul Krotki, president; L. H. Bartholomew, president and general manager; Elnor Bartholomew, secretary. Organized March 29, 1901, under laws of Utah, with capitalization \$1,000,000, shares \$2 par. Lands, 45 unpatented claims, area 900 acres, also a 25-acre millsite, showing 4 fissure veins, claimed to have an average width of 8' and claimed to give average assay values of 7% copper, 10% lead, 40 oz. silver and \$5 gold per ton, from sulphide ores, opened by 4 shafts, deepest 450', and by tunnels of 125', 150' and 800'. Has steam power. Company makes no effort to pay its honest debts, and its president and general manager suffer from the same disinclination.

COPPER BELT MINING & MILLING CO.**WYOMING.**

Office: care of A. H. Merchant, secretary, Grain Exchange, Omaha, Neb. Edward M. Weston, president; Wm. B. Parsons, vice-president; A. H. Merchant, secretary and treasurer; Edwin Hall, manager. Lands, 35 claims, of which 12 adjoin the Ferris-Haggarty and Osceola mines of the Penn-Wyoming, and 23 are in the Rawhide Buttes district, north of Guernsey and about 12 miles south of Lush, Wyoming. Company also has 160 acres of good pine timber. Mine has a 300' incline shaft, with about 1,200' of underground openings, on a fissure vein between quartzite and schist, showing carbonate ores and chalcocite, assaying up to 15% copper and \$12 gold per ton, with small silver values. Property is under bond and lease to Edwin Hall, who purposes organizing a new company thereon.

COPPER BLOSSOM MINE.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. A prospect, slightly developed.

COPPER BULL MINING CO.**COLORADO.**

Offices: 211 North 7th St., St. Louis, Mo., and L. B. 507, Pueblo, Colo. Mine office: Walsenburg, Huerfano Co., Colo. Chas. R. Mason, president; Isaac M. Mason, secretary and treasurer; Chas. O. Unfug, general manager; H. S. McIntyre, superintendent. Organized 1901, under laws of

Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 32 claims, patented, area 320 acres, showing five 7' fissure veins, carrying oxide ores, with claimed values of 10% copper, 2 oz. silver and \$80 gold per ton, which is much too high. Has shafts of 202' and 238', and a 464' tunnel. Company's advertising is entirely too lurid. The goods promised therein cannot be delivered.

COPPER BULLION MINING CO.**ARIZONA.**

Office: 224 Byrne Bldg., Los Angeles, Cal. Mine office: Pearce, Cochise Co., Ariz. Ezra T. Stimson, president; Percy H. Clark, secretary; Chas. M. Renaud, superintendent. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 30 claims, in the Turquoise district, showing 3 veins, claimed to average 14' in width, assaying 9% copper, 7 oz. silver and \$4 gold per ton, from carbonate and sulphide ores, which, of course, is too high. Has 4 shafts, deepest 210', and tunnels of 80' and 900'. Idle for some time.

COPPER BUTTE MINES.**ARIZONA.**

Office: 1007 New York Life Bldg., Minneapolis, Minn. Mine office: Phoenix, Maricopa Co., Ariz. Augustus C. Sheldon, president and general manager; Geo. H. Abeel, vice-president; Benj. C. Sheldon, secretary; Henry W. Knoche, treasurer; Allan G. Wilson, superintendent. Employs 6 men.

Organized July 21, 1900, under laws of Arizona, (under title Arizona Copper Mountain Mining Co., changed June, 1904, to present name), with capitalization \$6,000,000, shares \$10 par; issued, \$4,500,000. Report of company, as of date January 1, 1906, gave assets of \$70,000, with \$3,000 cash due company, and \$3,500 cash on hand, without liabilities.

Lands, 34 unpatented claims, area 690 acres, in the Walnut Grove district of Pinal county, Arizona, also a 5-acre millsite. Lands reach to the Gila river, which furnishes an unfailing water supply, and mine is served by the Phoenix & Eastern railway, only 1½ miles from the property. Country rocks are granite and limestone, intruded by an immense cupriferous breccia, ranging 1,300' to 3,000' in width, which has been traced about 7,000'. The breccia carries oxide and carbonate ores at surface, and for some little depth, succeeded by sulphides, which are shown in the lowest workings of the mine. The average assay of 39 samples gave 7.39% copper, with circa \$2 gold per ton, but the average of copper in actual production would be much lower, in all likelihood.

The first mining was done, 1879-1881, for silver, but was not a success, and the property remained idle until taken over, 1900, by present company. Development is by about twenty 15' pits, six shallow shafts of 30' to 60' depth, and two shafts of 175' and 465' respectively, also by four tunnels of less than 100' length, and two of 275' and 300' respectively, longest tunnel giving a depth of about 600' below the crest of the outcrop. The mine has about 2,000' of openings, estimated by management to show about 5,000,000 tons of ore, this apparently excessive figure being rendered more plausible by the vast width of the ore body.

Equipment includes a 60-h. p. steam plant, with 20-h. p. and 40-h. p. hoists, latter good for 1,000' depth. Buildings are a 20x30' machine-shop and two bunkhouses.

The property is one of great possibilities, because of the vast and almost inexhaustible extent of its ore body. The proposition is a big one, however, as has been learned by the management, which, in the spring of 1906, was conducting negotiations for the enlisting of additional capital. What the property needs—and the showing warrants the expenditure—is a considerable investment in tunneling and shaft-sinking, by which more ground is opened, followed by exhaustive mill-tests for concentration, and smelter-tests to determine average values. A few dozen assays afford an entirely inadequate basis for passing upon the average values of a property of such great size. As much money will be needed to properly test the Copper Butte as would develop a small mine, but, should the test show average values of even half the copper tenor shown by the assays, the property, given sufficient time and capital, could be made one of the really great copper mines of the world. The management is good, including a number of experienced mining men, but the proposition is so much greater, in every aspect, than first thought, that the raising of considerable further sums is imperative, if the property is to be given a thorough test.

COPPER BUTTE MINING CO.

SOUTH DAKOTA.

Mine office: Custer, Custer Co., South Dakota. Harry Francis, superintendent, at last accounts. Presumably idle.

COPPER BUTTES CONSOLIDATED MINING & SMELTING CO.

CALIFORNIA.

Office: care of Burden Gaylord, president, Los Angeles, Cal. Mine office: Bagdad, San Bernardino Co., Cal. J. B. Harvey, vice-president. Capitalization \$1,000,000, shares \$10 par. Lands, 31 claims, in two groups, 10 claims being near Ibis and balance near Bagdad. The Ibis group shows a quartz vein in granite, carrying auriferous and argentiferous chalcopyrite, which is highly silicious, requiring heavy fluxing. Has a 500' two-compartment shaft, with about 3,000' of openings, on veins of 18" to 4'. About 2,000' of openings have been made on the Bagdad claims, without finding payable ore. Management is considered honest, but prospects are considered poor.

COPPER CAÑON MINING CO.

NEW MEXICO.

Mine office: Abiquiu, Rio Arriba Co., New Mexico. J. E. Irvine, superintendent. Lands, 100 acres of undeveloped mineral claims. Idle.

COPPER CANYON MINE.

BRITISH COLUMBIA.

Lands, sundry claims near the foot of Mt. Sicker, British Columbia, opened by two tunnels, cutting a 4' vein, showing good ore. Idle.

COPPER CANYON MINING CO.

ARIZONA.

Mine office: Mayer, Yavapai Co., Arizona. S. T. Allen, president; L. T. Carr, vice-president; E. A. Girvin, secretary; C. A. Westenberg, treasurer; preceding officers, J. F. Littlefield, C. H. Haight and Wilbur Treadwell, directors. Organized under laws of Arizona, circa 1905, with capi-

talization \$15,000,000, shares \$1 par. Lands are 5 claims and a millsite, in the Black Canyon district, formerly held by the Black Canyon Copper Co., Ltd., which went out of business without paying its debts. Claims are considered promising, but capitalization is excessive, and company is not regarded with favor.

COPPER CAVE MINING CO.**WYOMING.**

Mine office: care of J. F. Crawford, Saratoga, Carbon Co., Wyo. Idle.

COPPER CENTER GROUP.**MEXICO.**

A group of claims near Moctezuma, Sonora, Mexico, on which some development work was done, by Dew R. Oliver, of San Francisco, California.

COPPER CENTURY GROUP.**ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. Geo. A. Lonsberry, superintendent. Ores carry copper, zinc, lead and silver. Has gasoline power. Presumably idle.

COPPER CHIEF MINING CO.**ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Arthur Hendy, superintendent. Lands, sundry claims near the Iron King mine of the Equator Mining & Smelting Co., circa 5 miles south of Jerome, on which the final payment of \$65,000 was made February, 1906. Mine shows a large body of auriferous and argentiferous copper ore, and is claimed to have upwards of \$3,000,000 worth of ore blocked out, which probably is an overestimate, although the property is generally regarded as one of considerable promise.

COPPER CHIEF MINING CO.**NEW MEXICO.**

Dead. Succeeded, 1903, by Sater Copper Co.

COPPER CHIEF MINING CO.**WASHINGTON.**

Office: Everett, Wash. Lands, 4 claims, between Galena and Mineral City, in the Silver Creek camp, Snohomish county, Washington, opened by a 600' tunnel, showing an 8' vein with a 2' paystreak.

COPPER CHIEF MINING CO., LTD.**MONTANA.**

Office: 604 The Rookery, Spokane, Wash. Mine office: Dillon, Beaverhead Co., Mont. Employs 14 men. H. A. Fosselman, president; J. S. Graves, vice-president; F. M. Longshore, secretary and general manager; F. M. Dudley, treasurer; S. C. Bishop, mine superintendent. Organized June, 1901, under laws of Washington, with capitalization \$375,000, shares 25 cents par. Lands, 7 claims, area 130 acres, in the Silver Star district of Madison county, Montana. Country rocks are granite and limestone, showing 5 contact veins, on all of which a little opening has been done, by 9 pits and shafts of 10' to 112' depth. Main vein, estimated by company to average 10' width, shows carbonates at surface, with chalcocite and chalcopyrite at a little depth, giving average assays of 10% copper, 2 oz. to 5 oz. silver and \$1.60 to \$31 gold per ton. Mine was opened 1898, closed 1903, reopened April 1, 1906. Has a 40-h. p. hoist, good for 1,000', and necessary mine buildings. Company plans sinking main shaft to depth of 1,000'.

COPPER CITY MINE.**ALASKA.**

Office: Coppermount, Prince of Wales Island, Alaska. Lands, sundry claims on the beach, at Cordova Bay, 6 miles south of Coppermount. Has

fair mine buildings, and has shipped some good ore to the Crofton smelter. Was developing, with a small force, late in 1905.

COPPER CLIFF MINES OF MONTANA, LTD.

MONTANA.

Offices: 8, Broad Street Ave., London, E. C., Eng. Mine office: Cliff, via Elliston, Powell Co., Mont. S. E. Illingsworth, chairman; R. S. Illingsworth, mine manager; A. Hebden, secretary. Organized Sept. 11, 1903, with capitalization £200,000, shares £1 par, in £65,000 "A" preference shares and £135,000 common shares, preference shares taking all profits up to par value of stock, after which preferred becomes common stock. Issued, £30,282. Lands, 140 acres, known as the Copper Cliff group, bought of the Copper Cliff Mining Co. Mine has a 200' shaft and tunnels of 300', 500' and 800', showing contact veins of fair width, carrying oxide, carbonate and sulphide ores, which are said to give average assay values of 10% copper and \$10 gold per ton. Company is said to plan operations on a considerable scale.

COPPER CLIFF MINING CO.

ARIZONA.

Dead. Property sold, 1902, to Catalina Mining Co.

COPPER CLIFF MINING CO.

MONTANA.

Succeeded, 1903, by Copper Cliff Mines of Montana, Ltd.

COPPER CLIFF MINING CO.

SOUTH DAKOTA.

Office: 79 Dearborn St., Chicago, Ills. Mine office: Rochford, Pennington Co., S. D. B. F. Brazee, president; Chas. A. Fohrman, vice-president and general manager; E. W. Eldridge, secretary. Organized 1899, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Property, carrying copper ore and graphite, is opened by a 350' tunnel, showing an 8' vein of low-grade copper ore. No copper mining has been done for several years, but company is mining graphite and making paint therefrom, in Chicago.

COPPER COBRE MINING CO.

ARIZONA.

Dead. Succeeded by Bradshaw Mountain C. M. & S. Co., also dead.

COPPER COMPANY OF BRITISH

BRITISH COLUMBIA.

COLUMBIA, LTD.

Offices: 11, Grocers' Hall Ct., London, E. C., Eng. Moribund.

COPPER CONCENTRATING CO.

MICHIGAN,

Office and works: Houghton, Houghton Co., Mich. Frank Howard, president; Thos. G. Mays, secretary and superintendent; T. H. Noble, treasurer; G. H. Elmore, consulting engineer. Organized July, 1905, with capitalization \$75,000. Has a 10-year contract with the Quincy Mining Co., for reworking the tailings from the Quincy mill, at Mason, on Torch Lake. Mill is 72x122', with a wing of 38x58' containing the power plant, and stands upon sands wasted from the Quincy mill. Sands for reworking are taken from the lake by a 16x28' scow, carrying a 12x24' pumphouse, with centrifugal sucker pump, connected by a 10" spiral pipe with the mill, the pipe having swing joints and being carried on bents. At the mill the sand is discharged into a launder connecting with the boots of 6 endless-belt bucket-elevators, in three frames, each frame having two elevators with 20' belts

and buckets. Discharge from the elevating belts leads to 6 roughing jigs, each with 5x15' sieves, which reject about 80% to 85% of the material, waste being returned to the lake, and the remaining 15% to 20% of material concentrated. The sand retained is classified as coarse, fines and slimes. Coarse sands are sent to crushing rolls and a Chilean mill, thence join the fines in going to the finishing jigs. There are settling tanks for the slimes, the flow of diluted pulp through the tanks being very slow, settlers discharging through siphon tubes at the bottom, and slimes again going over oscillating tables.

Power is furnished by a 250-h. p. gas engine, using producer gas made from pea coal. There is a 50-kw. generator for lighting purposes and operating the sand pump. Machinery is belt-driven throughout, and all material is handled by gravity. Although the plant is of about 2,000 tons daily capacity, it has been so carefully designed that a force of about 8 men only is required. This is the largest tailings plant in the world, and the outcome of its operations will be awaited with much interest. The sands to be handled are low in grade, but by virtue of a plant of the very best design, embodying practically all available improvements, and operating on an immense scale, the prospects of success seem good.

COPPER CONTACT MINE.**NEVADA.**

Mine office: Sodaville, Esmeralda Co., Nev. Owned by A. F. Bettles, J. D. Thompson and W. R. Smith, of Salt Lake City, Utah. Idle.

COPPER CORPORATION OF CHILI, LTD.**CHILE.**

Voluntarily liquidated, December, 1906.

COPPER CREEK CONSOLIDATED COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, Prescott, Arizona.

COPPER CREEK CONSOLS, LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Ashcroft, B. C. Lands, on Criss Creek, difficult of access, are claimed to show a vein of 3' to 4' width, assaying under 2% copper, and up to 17 oz. silver per ton.

COPPER CREEK MINING CO.**ARIZONA.**

Office: Tucson, Arizona. Mine office: Copper Creek, via Willcox, Graham Co., Arizona. Employs 10 men. Frank J. Sibley, president and general manager; M. W. Atwood, vice-president; D. J. Reynolds, 2d vice-president; R. Roy Sibley, treasurer and superintendent; Hon. L. C. Hughes, secretary; preceding officers constitute the directorate. Organized June 18, 1903, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par; issued, \$1,350,000. Paid dividends, 1904, of \$170, and in 1905, of \$1,565.69, presumably on guaranteed treasury stock. Annual meeting, second Wednesday in April.

Lands, 34 claims, area 680 acres, unpatented, also a 30-acre millsite, in the Bunker Hill district, Galurio Mountains. Country rocks are limestone, porphyry and rhyolite, showing 10 ore bodies, as fissure veins in rhyolite and as contact veins between rhyolite and porphyritic rocks, of which 2 veins are undergoing development. Main vein is reported by company to average 7' width and to be traceable 7,000'. Ores are cuprite, tenorite, malachite,

chalcocite, bornite, and chalcopyrite, with occasional chrysocolla. Company reports that first-grade ore has given average smelter returns of 20.8% copper and 14.5 oz. silver per ton. Development is by shafts of 85', 110', 200' and 250', and by tunnels of 25', 50', 75', 90' and 225', with total underground openings of 3,000', estimated to show 46,000 tons of ore, with 1,200 tons blocked out for stoping.

Equipment includes a 20-h. p. hoist, good for 800', and a 4-drill Shaw air-compressor, with 7 buildings, including smithy, machine-shop and 4 dwellings. Nearest railway is the Southern Pacific, 60 miles distant, but the Phoenix & Eastern, now building, will pass within 12 miles. Production, 1905, was 48,900 lbs. fine copper. Shipping of small lots to smelter was resumed, October, 1905. Management plans deepening the main shaft, adding an electric hoist and 2 electric drills, and making other necessary improvements, during 1906.

COPPER CREEK MINING CO.

CALIFORNIA.

Office: care of J. B. Campbell, Fresno, Cal. Apparently the same as the Copper Mountain Development Co., and apparently moribund.

COPPER CREST MINING CO.

CALIFORNIA.

Office: care of G. W. Branthoover, president, Los Angeles, Cal. Mine office: Redding, Shasta Co., Cal. Organized 1905, to operate the Milton mine, and to develop the Copper Crest group.

COPPER CROWN OF ARIZONA MINING CO.

ARIZONA.

Dead. Lost lands January 1, 1905, through failure to do annual assessment work. Described Vol. V.

COPPER CROWN MINING CO., OF MICHIGAN.

MICHIGAN.

Office: 424 Rialto Bldg., St. Louis, Mo. Mine office: Matchwood, Ontonagon Co., Mich. Employs 16 men. Dr. M. J. Hopkins, president; J. E. Allen, vice-president and treasurer; W. R. Hopkins, secretary; Baxter L. Brown, general manager; preceding officers, F. O. Culter and F. L. Huntoon, directors; J. F. Finnegan, superintendent. Organized July 18, 1902, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Annual meeting, second Tuesday in July.

Lands, 3,740 acres, lying 6 to 8 miles west of the Victoria mine, and 8 miles north of Matchwood, the nearest railroad point. Lands include a number of old trans-Ontonagon mines, on all of which more or less work was done, mainly circa 1850-1860. Principal properties are the Hamilton, Norwich and Lafayette. First operations of present company were on the Hamilton tract, on which a tunnel was driven 602', and about 500' of drifts run. A shaft was sunk 270', on the Meads vein, showing a little copper. The early work was sadly misdirected, a shaft being sunk on a drift boulder, in sandstone, and a 602' tunnel driven to secure a "back" of only about 300'. More recent work has been done on the Norwich group, generally considered a more promising property than the Hamilton. The Norwich is, next to the Victoria, the most promising and most extensively opened mine west of the Ontonagon river, and seems worthy of systematic development. The Norwich tunnel is 950' long, with about 1,000' of drift-

ing on the Norwich lode, which gives an encouraging showing of copper. In April, 1906, the work of unwatering the old Norwich mine was begun. The Norwich, opened 1850 and closed 1865, expended assessments of \$230,000, and produced 496 tons, 1,360 lbs. fine copper, securing masses of native metal up to 10 tons in weight. The lode is bunchy, but shows considerable stamp rock, of promising character. The Meads vein was located by a series of pits along the outcrop, left from prehistoric mining operations. The 270' shaft thereon shows a strong lode, ranging up to 25' width, and has a 720' drift to the westward, on the 4th or bottom level.

Equipment includes a powerhouse, pumphouse, toolhouse, smithy, barn and 9 dwellings, with a 125-h. p. engine, 250-h. p. Hamilton-Corliss engine, 40-kw. dynamo, 250-h. p. boiler and air-compressors of 5-drill and 6-drill capacity, with power drills.

The advertising of this company has been most misleading, and was done, either from sheer ignorance, or with a desire to deceive. Early mining work was very badly planned, and the money spent thereon was wasted. Latter work has been better planned, and if the development of the old Norwich mine is undertaken upon approved lines, a mine may be made in time. The management is now considering the erection of a one-stamp mill of 300 tons daily capacity, but the openings do not warrant the building of a mill at such an early stage in the development of the mine. Inasmuch as the management has shown a decided improvement during the past year, and work has been continued steadily, it is to be hoped that the officials may come to see the wisdom of adding greatly to their present mine openings, before hazarding the construction of a mill.

COPPER CROWN OF NOVA SCOTIA MINING CO. NOVA SCOTIA.

Letter returned unclaimed from former office: 373 Washington St., Boston, Mass. Samuel K. Paige, president; Geo. B. Holden, secretary and treasurer; W. H. Kennan, manager. Organized under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Lands, near Pictou, Nova Scotia, are claimed to show extensive ore bodies, averaging 5% to 6% copper. Has a smelter, with 300-ton blast-furnaces and a reverberatory furnace of 70 tons daily capacity, located with tidewater in front and railroad tracks behind. Fuel and flux are abundant and cheap. Company is in litigation, and bankruptcy seems inevitable.

COPPER DUKE MINE.

ARIZONA.

Owned by Tip Top Copper Co.

COPPER DUKE MINE.

MONTANA.

Mine office: Copperopolis, Meagher Co., Montana. Idle.

COPPER EAGLE MINING CO.

OREGON.

Mine office: Merlin, Josephine Co., Oregon. R. J. Ginn, president; N. P. Hansen, secretary; J. C. Mattison, superintendent. Has a fairly wide quartz vein, giving assays of 10% to 30% copper, opened by a 300' tunnel.

COPPER ESTATES OF WESTERN AUSTRALIA, LTD.

AUSTRALIA.

Offices: 66, Finsbury Pavement, London, E. C., Eng. J. McLaren, secretary. Organized March 4, 1903, as a reconstruction of company

of same title, which, in turn, succeeded the Derby Syndicate, Ltd., with capitalization £15,000, shares 5s. par. Lands, 1,050 acres, freehold, near Northampton, Western Australia.

COPPER EXPLORERS, LTD.

AUSTRALIA.

Offices: Winchester House, London, E. C., Eng. A. E. Barton, chairman; L. Malleson, secretary. Organized January 1, 1900, with capitalization £40,000, shares £1 par, to acquire the North Cobar mine, in New South Wales. Idle.

COPPER FALLS MINE.

MICHIGAN.

Absorbed, 1898, by Arnold Mining Co. Fully described in Vol. I.

COPPERFIELD MINES.

VERMONT.

Office: 820 Pennsylvania Ave., Pittsburg, Pa. Mine office: Copperfield, Orange Co., Vt. Geo. Westinghouse, owner. Property includes the old Ely and Copperfield mines, having a strong ore body carrying low-grade disseminated chalcopyrite. Has a 3,700' main shaft, sunk at an angle of 23°, giving a vertical depth equal to circa 1,500', and has a 1,000' tunnel, leading from the 300' level to mill. Reduction plant includes a combined mill and smelter, connected with the mine by a gravity tram. Smelter has two water-jacket blast-furnaces, one reverberatory furnace and one converter stand, making blister copper of 98% to 99% tenor, when operated. Property was worked on a considerable scale, previous to circa 1860, and was reopened by present owner in 1900, but has been idle for several years.

COPPERFIELD MINING CO.

UTAH.

Letters returned unclaimed from former office, Bingham Canyon, Utah.

COPPER FIELDS OF NAMAQUALAND, LTD.

CAPE COLONY.

Offices: 10, St. Helen's Place, London, E. C., Eng. Lieut.-Col. W. W. Cragg, chairman; N. A. Eustace, secretary. Organized Sept. 31, 1897, with capitalization £100,000, shares £1 par; issued, £78,432. Lands, 354 acres, in Little Namaqualand, Cape Colony, South Africa. Idle.

COPPER GIANT GOLD & COPPER MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Encampment. Carbon Co., Wyo. D. Frank Powell, president; P. H. Kennedy, secretary, Presumably moribund.

COPPER GIANT MINING CO.

ARIZONA.

Office: care of O. Z. Kane, general manager, Tucson, Ariz. Mine office: Silver Bell, Pima Co., Ariz. Lands, 50 claims, in several different groups, lying south of the Imperial mine and to the eastward of the Silver Hill Mountains, opened by about 500' of shafts and tunnels, with a 100' shaft on the Copper Giant claim. Property shows a contact vein, with bold outcrops, between limestone and quartzite. Ore is chalcopyrite, with occasional chalcocite, and ores from the Copper Giant shaft are claimed to average 15% copper, 20 oz. to 40 oz. silver and \$4 to \$7 gold per ton.

COPPER GIANT MINING CO.

Office: care of L. B. Cornell, secretary, Spokane, Wash. Wm. H. Luden, president. Organized 1897, under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Lands, said to be 3 claims, with a fair show-

ing of ore. Company has no money and doesn't know where to get any.
COPPER GLANCE MINING CO. **ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. S. W. Clawson, president and treasurer; A. S. Barker, secretary; C. L. Beckwith, general manager. Organized March, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Annual meeting, March 9. Lands, 24 patented claims, area 480 acres, in the Warren district, about 7 miles southeast of Bisbee. Has shafts of 50', 100', 140' and 560', with tunnels of 75' and 150'. Idle since circa 1904. Fully described in Vol IV.

COPPER GLANCE MINING CO.

NEW MEXICO.

Mine office: Taos, Taos Co., N. M. Idle for several years.

COPPER GLANCE MINING & MILLING CO. **COLORADO & WYOMING.**

Office: Sherwood Bldg., Elgin, Ills. Mine office: Encampment, Carbon Co., Wyo. H. N. Anderson, president; N. C. Westerfield, vice-president; C. L. Wetzel, secretary and treasurer; Jas. N. McBride, general manager. Organized under laws of Wyoming, with capitalization \$2,000,000. Property is known as the Girouette group. Company also had an option on property in the La Sal district of Montrose county, Colorado, but apparently has lost same. Wyoming property idle since April, 1905, and company ended the year with an indebtedness of about \$32,000, including \$7,500 interest, and manifests no disposition to pay its debts, the energies of the management apparently having been exhausted in peddling stock.

COPPER GLOBE GROUP.

UTAH.

Office: care of Dr. Walter R. Pike, owner, St. George, Utah. Lands, sundry claims, in the southwestern part of Emery county, Utah, showing a large body of low-grade ore, slightly developed by tunnel, 1899-1901.

COPPER GLOBE MINING CO.

UTAH.

Dead. Lands, in Utah, sold November, 1902.

COPPER-GOLD MINING CO.

WASHINGTON.

Mine office: Bossburg, Stevens Co., Wash. S. G. Wilson, superintendent, at last accounts. Developments show argentiferous copper ores. Idle.

COPPER-GOLD MINING & MILLING CO.

WYOMING.

Letter returned unclaimed from former mine office, Hecla, Wyo.

COPPER GORGE DEVELOPING CO.

NEW MEXICO.

Office: 82 Wisconsin St., Milwaukee, Wis. Mine office: Santa Rita, Grant Co., N. M. Lands, 12 claims. Company is asserted, in the press, to have put in a big machinery plant and concentrator, and to plan shipping concentrates to the Comanche smelter, at Silver City. Company apparently was promoted by C. T. McElroy, of questionable reputation, and is not regarded with favor.

COPPER HILL MINE.

ALABAMA.

An idle property, near Stone Hill, Cleburne county, Alabama. Was known first as the Woods mine. Opened 1870, closed 1879. Had a smelter and worked as many as 500 men. Closed, owing to exhaustion of high-grade ores. Vein is 24' wide, mineralized near walls to extent of 3% to 7% copper. Value of production secured was about \$1,300,000.

COPPER HILL MINE.**ARIZONA.**

Owned by Arizona Commercial Copper Co.

COPPER HILL MINE.**CALIFORNIA.**

Office and mine: care of W. F. Detert, owner, Jackson, Amador Co., Cal. Mine, on the Consumnes river, was opened circa 1861, and worked about 20 years, with a considerable production. Vein formation, quartz-porphry, is 500' to 600' wide, with heavy gossan capping. Ore is chalcoppyrite, associated with iron pyrites.

COPPER HILL MINING CO.**ARIZONA.**

Correct title is Arizona Copper Hill Mining Co.

COPPER HILL MINING CO.**NEW MEXICO.**

Dead. Lands, sold, November, 1903, to A. B. Renehan, for \$7,600.

COPPER HILL MINING & MILLING CO.**WASHINGTON.**

Office: 504 Empire Bldg., Spokane, Wash. F. J. Heller, president; G. O. Nettleton, secretary. Organized 1899, with capitalization \$75,000, shares 5c par. Lands, 4 claims, area 80 acres, in the Newport district of Stevens county, Washington, with rail and water transportation easily accessible. Has a 230' shaft and a 260' tunnel, showing an 18' vein carrying chalcoppyrite, disseminated in pyrrhotite. Idle at last accounts.

COPPER HILL MINING & SMELTING CO.**ARIZONA.**

Office: care of Stephen Burger, president, Salem, Mass. Letter returned unclaimed from former mine office, Jerome, Yavapai Co., Ariz. John F. Jackson, superintendent. Organized 1905, under laws of Arizona. Lands, sundry claims, known as the Kyle-Hopkins group, having 250' of openings, showing native copper and high-grade ore.

COPPER INDEPENDENT CONSOLIDATED MINING CO.**WASHINGTON.**

Office: 61 Court St., Boston, Mass. Mine office: Silverton, Snohomish Co., Wash. M. V. Little, president; E. P. Crooker, secretary; Arthur W. Hawks, general manager. Capitalization \$3,000,000, shares \$1 par. Bonds, \$62,000 outstanding. Lands, 2 groups of claims, also several millsites. Has 5 tunnels, longest 1,200', with several thousand feet of underground workings, on a fissure vein in granite. Plant includes a concentrator, 52x133', of wood, equipped with crushers, rolls and tables, said to be of 300 tons daily capacity. A turbine develops 550 horse power from the Stillaguamish river. Company began selling stock and paying 6% dividends simultaneously, and came to grief, as predicted by the Copper Handbook. Property possibly of value, if handled by an honest and capable management.

COPPER JACK MINING CO.**UTAH.**

Office and mine: Eureka, Juab Co., Utah. J. C. Jensen, president; J. T. Williams, vice-president; Geo. A. Udall, secretary; D. D. Hanks, treasurer; Geo. Hanson, general manager. Organized July 31, 1905, under laws of Utah, with capitalization \$75,000, shares 10 cents par. Lands, 24 claims, area 480 acres, in the Erickson district, Tooele county, Utah, opened by a 22' shaft, showing ore assaying 13% copper. Idle.

COPPER KEY MINE.**WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. E. J. Delbridge, manager.

Lands adjoin the Oversight group, on the north. The upper tunnel is in ferruginous copper ore, and 90 cars shipped to smelter gave average returns of \$12 per ton. The 400' lower tunnel is in limestone, and is said to show a 40' vein of shipping ore. A third tunnel is planned.

COPPER KING OF ARIZONA.**ARIZONA.**

Office: 116 Nassau St., New York. Letter returned unclaimed from former mine office, Pearce, Cochise Co., Ariz. Elisha Boitel, president; Thos. F. Gaynor, secretary and treasurer. Organized, 1903, under laws of West Virginia, with capitalization \$5,000,000, shares \$1 par, as successor of the Copper King of Arizona Mining Co., organized 1895, which peddled stock assiduously for many years, under management, first of the late B. C. Davis, and later, under control of Gaynor. Operations were begun at Bisbee, transferred thence to Solomon Springs, thence to Barrett and thence to Pearce, all in Cochise county, Arizona. Original property, the old Copper King mine, at Bisbee, was lost to company, 1903, through neglect, but having become prospectively valuable, suit was brought for recovery, but was lost, October, 1905. A \$250,000 issue of 7% bonds is supposed to have been authorized, circa 1905. Management of preceding company was flagrantly bad for many years, and present corporation shows but slight improvement. Is in debt for labor, and local standing of management is nil.

COPPER KING OF ARIZONA MINING CO.**ARIZONA.**

Reorganized, 1903, under title Copper King of Arizona.

COPPER KING CONSOLIDATED MINING CO.**COLORADO.**

Incorporated, April, 1903, by Milo A. Smith, et al, with capitalization \$300,000, to operate in Jefferson and Park counties, Colorado. Idle.

COPPER KING, LTD.**CALIFORNIA.**

Mine office: Letcher, Fresno Co., Cal. Geo. W. Ade, receiver; C. D. Leavitt, Jr., superintendent. Was an English corporation, and is said to have been wound up in 1903, but the estate is still in the process of adjustment, and the property is in operation. Lands, 90 acres, circa 27 miles from Fresno, opened by 2 air shafts and a 250' main working shaft, with six levels opened and about one-half mile of drifts. Shaft is to be sunk 200'. Ore body is a schistose vein of about 100' width, with a 2' to 20' paystreak carrying oxide and carbonate ores above, and sulphides below, ores averaging about 7% copper. Ore formerly was hauled 17 miles, by a traction engine, to the smelter at Seal Bluff Landing, but is now hauled by wagon. The reduction plant included a concentrator and smelter, latter having two 50-ton McDougall roasting furnaces for pyritic smelting, and a 100-ton reverberatory furnace burning crude petroleum. It is probable that the reduction plant has been sold, as ore is now sent to Tacoma for smelting. The property is doing very well, under the management of Mr. Ade, and, although ending 1905 with a net indebtedness of \$500,000, a legacy from the old management, which squandered about £250,000, ended the year with \$78,000 in the bank and \$35,000 worth of ore in transit and at the smelter. Production is at the rate of 100 tons of ore daily.

COPPER KING MINE.**ARIZONA.**

Office and mine: care of Peter Johnson, owner, Bisbee, Cochise Co., Ariz. This is the original property held by the Copper King of Arizona, but was abandoned several years ago, and relocated, 1903, by present owner. Has a 625' shaft, in porphyry, which has cut a number of small stringers of copper ore. Property, which lies between the Denn-Arizona and Cochise Development tracts, was generally regarded as worthless, until circa 1904, but developments on the Junction property indicate the possibility of considerable ore bodies underlying the porphyry, near its junction with limestone, in the Warren district. Material on dump, taken from shaft, is altered and slightly mineralized porphyry, carrying considerable iron pyrites.

COPPER KING MINE.**ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. S. A. D. Upton, owner. A prospect only. Idle at last accounts.

COPPER KING MINE.**BRITISH COLUMBIA.**

Lands, six claims, near the Queen Victoria property, at Beasley, 7 miles west of Nelson, Kootenay district, British Columbia, showing several exposures of sulphide ore. Has a gravel overburden, rich in float ore. Idle for some years.

COPPER KING MINE.**BRITISH COLUMBIA.**

Mine office: Kamloops, Yale district, B. C. Lands, sundry claims, 16 miles west of Kamloops, showing ore giving assays of 5% to 20% copper, 1 oz. to 6 oz. silver and \$10 to \$20 gold per ton. Shipped 500 tons to the Crofton smelter, May, 1901.

COPPER KING MINE.**CALIFORNIA.**

Office and mine: care of W. A. Sanger, Big Pine, Inyo Co., Cal. Has an outcrop of 100' width, with a 60' shaft, showing malachite. Idle some years.

COPPER KING MINE.**COLORADO.**

A property at Turret, Chaffee Co., Colo., held by Calumet Copper Co.

COPPER KING MINE.**COLORADO.**

Office and mine: care of John Westenrider, owner, Florence, Fremont Co., Colo.

COPPER KING MINE.**COLORADO.**

Office and mine: care of Duress & Dowd, lessees, Gilpin, Gilpin Co., Colo. Property is said to show good copper ore.

COPPER KING MINE.**COLORADO.**

Mine office: Twin Lakes, Lake Co., Colo. Lands, 11 claims, on Middle Mountain, circa 13 miles from Twin Lakes, owned by James Harrison, et al. Formation is micaceous granite, with porphyry dykes, showing a 20' fissure vein, with a 12" paystreak on the hanging-wall carrying good assay values in copper, silver and gold. Is slightly developed, by tunnel.

COPPER KING MINE.**IDAHO.**

Mine office: Landore, Washington Co., Idaho. Is said to have a 15' vein showing a 3' paystreak of bornite, and, at last accounts, 1905, was preparing to begin shipments to the Landore smelter.

COPPER KING MINE.**MONTANA.**

One claim, 2 miles southeast of Parrot, Madison county, Montana, giving ores assaying up to 12.5% copper, 0.85 oz. silver and \$2.80 gold per ton. Idle.

COPPER KING MINE.**OREGON.**

Mine office: Comer, Grant Co., Oregon.

COPPER KING MINE.**SOUTH DAKOTA.**

Letter returned unclaimed from former mine office, Terry, S. D.

COPPER KING MINE.**TASMANIA.**

Mine office: Burnie, Tasmania. Property, on the northwest coast, has shipped 42 tons of 14% ore to Newcastle. Employs 9 men.

COPPER KING MINE.**WASHINGTON.**

Lands, sundry claims, in Ferry county, Washington. Ores include argentiferous galena, and chalcophyrite that is both auriferous and argentiferous. Development is by 2 tunnels.

COPPER KING MINE.**WASHINGTON.**

At Chewelah, Wash. Owned by Chewelah Copper King Mining Co.

COPPER KING MINE.**WYOMING.**

Mine office: Jelm, Albany Co., Wyo. Said to have been sold, 1902, to Messrs. Martin & Lambert, of Chicago, for \$30,000.

COPPER KING MINE.**WYOMING.**

Letter returned unclaimed from former mine office, Tie Siding, Wyo.

COPPER KING MINE.**YUKON.**

Mine office: Whitehorse, Yukon, Canada. Has a 175' shaft, showing bornite below depth of 20'. Has shipped 400 tons of high-grade ore to smelters at Everett, Wash., and Ladysmith, B. C. Property is decidedly promising, but cannot be made a producer until given better shipping facilities, or a local smelter, present freight rates being outrageously high.

COPPER KING MINING CO.**ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Lands, sundry claims, in the Tucson Mountains.

COPPER KING MINING CO.**BRITISH COLUMBIA.**

Mine office: Cameron Lake, Nanaimo district, B. C. Has a 100' tunnel, showing copper ore. Idle for several years.

COPPER KING MINING CO.**COLORADO.**

Office: Cheyenne, Wyo. Mine office: Boulder, Boulder Co., Colo.

COPPER KING MINING CO.**COLORADO.**

Succeeded, circa 1904, by Pearl Copper Mining & Smelting Co.

COPPER KING MINING CO.**IDAHO.**

Office and mine: Shoup, Lemhi Co., Idaho. Earl Gilbreath, manager. Is a limited partnership. Lands, 11 claims, area 220 acres, also 260 acres miscellaneous lands, on Beaver Creek, in the Mackinaw district, showing numerous fissure veins in quartzite, of which three, with average width of 10' to 12', are opened by 2 shallow shafts and 7 tunnels, of which 3 are 300' each in length, with a total of about one half-mile of openings, showing cuprite and malachite giving average assays of 7% copper, up to 30% lead,

1 oz. to 30 oz. silver and \$1 to \$3 gold per ton, ore averaging about \$43 per ton in total values. Is working, with a small force.

COPPER KING MINING CO.

MONTANA.

Letter returned unclaimed from former mine office, Missoula, Mont.

COPPER KING MINING CO.

OREGON.

Letter returned unclaimed from former office, Pendleton, Ore. Incorporated, August, 1902, with capitalization \$1,500,000.

COPPER KING MINING CO.

UTAH.

Lands, supposedly 3 claims, in the Big Cottonwood district, Utah.

COPPER KING MINING CO.

WASHINGTON.

Mine office: Sumas, Whatcom Co., Wash. Presumably idle.

COPPER KING MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Rawlins, Wyo.

COPPER KING MINING & MILLING CO., LTD.

IDAHO.

Office: Kellogg, Idaho. Mine office: Iron Springs, Idaho Co., Idaho. Employs 10 men. P. P. Webber, president; Peter Mason, vice-president; Chas. W. Simmons, secretary; Ed. Hearing, treasurer; Chas. McKinnis, general manager; Jos. Rogers, superintendent. Organized March 2, 1902, under laws of Idaho, with capitalization \$1,250,000, shares \$1 par. Lands, 7 claims, area 140 acres, also a 10-acre millsite and 80 acres timber lands, with total landed holdings of 230 acres, in the Rapid River division of the Seven Devils district. Property shows two fissure veins, in phonolite, of which one, of 8' to 10' width, is opened by 7 pits and shafts, deepest 50', and by tunnels of 55', 200' and 300', showing argentiferous and auriferous bornite, and medium grade chalcopryite, giving assays up to 45% copper, up to 445 oz. silver and up to \$45 gold per ton. Management plans continuing mining development, building roads and ore-bins, and beginning stoping, during 1906.

COPPER KING MINING & MILLING CO.

WASHINGTON.

Office and mine: Vancouver, Clark Co., Wash. Organized January, 1904, with capitalization \$1,000,000, shares \$1 par. Presumably idle.

COPPER KING MINING & MILLING CO.

WASHINGTON.

Organized, 1898, under laws of Washington, with Geo. R. Trask, president, and Sam Hanauer, secretary. No trace of company's lands or present office found, after protracted investigation.

COPPER KING MINING & SMELTING CO.

IDAHO.

Office and mine: Mullan, Shoshone Co., Idaho. Employs 4 men. E. B. Crawford, president; H. W. Ingalls, secretary and general manager. Wm. Commerilh, treasurer. Organized August 28, 1905, under laws of Idaho, with capitalization \$1,500,000, shares \$1 par. Company reports \$10,430 cash on hand, April 27, 1906. Lands, 6 claims, in the Hunter and Leland districts, carrying a contact vein, between quartzite and limestone, said to range 10' to 40' in width, opened by a 40' shaft and an 1,800' tunnel, showing sulphide ore assaying 5% copper, 30% to 40% lead and 16 oz. silver per ton. Company plans sinking the shaft 100', and drifting therefrom.

COPPER KING MINING SYNDICATE.**WASHINGTON.**

Office: Tacoma, Wash. R. E. McFarlane, president; E. Areith, secretary and treasurer; D. E. Guiley, superintendent. Capitalization, \$10,000,000.

Lands, 64 claims, in Pierce county, Washington. Company has acquired the old Eastlick mine, opened by a 130' crosscut tunnel, with a small amount of drifting, which has produced some good ore. District is said to be rich, but not easily accessible. Idle.

COPPER KINGS MINING CO.**UTAH.**

Was promoted by H. C. Baker, of Ogden, Utah. Dead. Formerly held lands near Brigham, Box Elder county, Utah. Was succeeded by Consolidated Mining & Smelting Co., also dead.

COPPER KNOB MINING CO.**NORTH CAROLINA.**

Succeeded, circa 1902, by Blue Ridge Copper Mining Co.

COPPER-LEAD SMELTING CO.**WASHINGTON.**

Office: care of H. A. Noble, Seattle, Wash. Wm. Selover, manager. Organized 1905. Plans building a copper and lead smelter and refinery, to cost about \$1,000,000, on Puget Sound, near and tributary to Seattle. Plans call for a smelter to have about 1,000 tons daily copper capacity and about 500 tons daily lead capacity, with refinery to include a 50-ton copper plant, 50-ton lead plant and 50-ton gold and silver refinery.

It is planned to begin construction about June, 1906, and to complete the works within one year. Plant is planned to operate on coast and Alaskan ores, and, if built, will be the largest reduction works west of Anaconda, and a strong competitor of the Tacoma Smelting Co.

COPPER MILLS SYNDICATE, LTD.**AUSTRALIA.**

Offices: 6, Gresham, St., London, E. C., Eng. Organized March 30, 1906, with capitalization £10,000, to operate in New South Wales, or elsewhere.

COPPER MINES OF MOUNT LYELL WEST, LTD.**TASMANIA.**

Offices: 16, St. Helen's Place, London, E. C., Eng. Mine office: Gormanson, Montagu Co., Tasmania. Chas. McCulloch, chairman; A. G. Ogilvie, mine manager; Herbert A. H. Russell, secretary. Organized Oct. 7, 1897, under laws of Tasmania, with capitalization £400,000; issued £230,000.

Lands, 8 leases, area 70 acres, adjoining the Mt. Lyell Mining & Railway Co., showing several wide ore bodies, assaying 3% to 7% copper, with small gold and silver values. Development is by 2 tunnels. Idle since June, 1904.

COPPER MINES OF SPAIN SYNDICATE, LTD.**SPAIN.**

Did not go to allotment.

COPPER MINES OF TIBET, LTD.

Offices: 5, Great Winchester St., London, E. C., Eng. Capital, fully issued, and all paid in, presumably in cash, £7.

COPPER MINING & DEVELOPING CO.**CALIFORNIA.**

Office: care of J. B. Campbell, president, Fresno, Cal. Lands, 50 claims,

area circa 1,000 acres, 35 miles east of Kaweah, Tulare county, California, slightly developed, showing carbonate and sulphide ores, assaying 2% to 25% copper. Idle, with no prospects of resumption.

COPPER MINING & SMELTING CO. OF ONTARIO, LTD. ONTARIO.

Offices: 9, Arundel St., Strand, London, W. C., Eng. Mine office: Bruce Mines, Algoma, Ont. John Wm. Hughes, chairman; C. E. Osborn, secretary; T. Hayes Sheen, general manager; H. J. Carnegie-Williams, superintendent; A. Cyril Boyce, Frank M. Perry, C. Vernon Plummer, Canadian advisory board; Pellew-Harvey & Fell, consulting engineers; Turquand, Youngs & Co., British auditors; Clarkson & Cross, Canadian auditors. Organized August 16, 1905, under laws of Ontario, with capitalization \$1,000,000, shares \$5 par.

Property is the old Bruce mines, area 12,800 acres, on Georgian Bay. Mine was opened 1846 and closed 1876, after producing copper to the value of \$3,300,000. Mine has a depth of 1,500', showing several parallel east and west veins, traversing diabase, of 4' to 6' average width, carrying sulphide ores, mainly chalcopyrite, with quartz gangue. Ore is estimated to average about 5% copper.

Reduction plant includes a 400-ton concentrator, equipped with crushers, rolls, jigs, hydraulic sizers, round tables, Griffin mill and Frue vanners. Estimates have been secured on the first 250-ton unit of a 500-ton smelter. Miscellaneous improvements include a coal wharf, merchandise wharf, electric light plant and telephone system. Management hopes to blow in the first unit of the smelter early in 1907.

COPPER MOUNTAIN DEVELOPMENT CO.

CALIFORNIA.

Succeeded by Copper Mining & Developing Co.

COPPER MOUNTAIN GROUP.

UTAH.

Office: care of B. T. Lloyd, 323 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Was owned formerly by the Copper Mountain Mining & Milling Co. Lands, 6 claims, having open-cuts and shallow shafts of 5' to 60', and a main shaft, of peculiar construction, about 250' in depth, showing an iron ore vein of 4' to 14' width, giving assays of 18% to 28% copper. Shaft is vertical for about 100', thence drops 100' at an angle of 75°, thereafter has 50' sunk at an angle of 70°, which is excellently bad engineering. Has gasoline power.

COPPER MOUNTAIN MINING CO.

CALIFORNIA.

Letter returned unclaimed from former office, 310 Laughlin Bldg., Los Angeles, Cal. Mine office: Victor, San Bernardino Co., Cal. W. A. Cooper, president; J. S. Longley, secretary; J. A. Morlan, manager. Lands, 10 claims, including the Amazon mine, showing a 200' gossan outcrop, opened circa 1873, reopened 1901. Main shaft, 200', shows sulphide ores assaying 8% to 10% copper. Is said to have about 10,000 tons of ore on the dump.

COPPER MOUNTAIN MINING CO.

NEVADA.

Mine office: Tacoma, Elko Co., Nev. Has steam power. Idle.

COPPER MOUNTAIN MINING CO.**WYOMING.**

Office: care of Dr. C. W. Long, manager, Denver, Colo. Lands, sundry claims, on Copper Mountain, 20 miles southeast of Big Horn, Wyoming, claimed to show a 6" vein of ore assaying 40% copper, 517 oz. silver and \$15 gold per ton.

COPPER MOUNTAIN MINING**WASHINGTON & BRITISH COLUMBIA.****& DEVELOPMENT CO.**

Office: 5406 Union Ave., South Tacoma, Wash. Mine offices: Ryan, Stevens Co., Wash., and Quatsino, Atlin district, B. C. B. S. Cowles, president; Jos. Hutchinson, secretary; B. D. Holcomb, general manager; A. T. Macaulay, superintendent. Capitalization \$200,000, shares 10 cents par. The property at Ryan is idle. This has 4 claims, area 90 acres, with 3 ore bodies, one lense 75' wide being opened by a 300' shaft and a 115' tunnel. The June group, at Quatsino Sound, includes 5 claims, area 258 acres, showing an ore body said to be 100' wide, with measured length of 3,000', giving assays of 6% to 8% copper, 3 oz. silver and \$2 gold per ton, from chalcopryrite. A large amount of ore is shown on surface, and the deposit has been worked open-cast. Considered promising, but idle.

COPPER MOUNTAIN MINING & MILLING CO.**UTAH.**

Bankrupt. Property lost, 1904, through bad management.

COPPER MOUNTAIN MINING & SMELTING CO.**MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. J. H. McCabe, manager. Organized, 1904, with capitalization \$1,000,000. Lands, circa 50 claims, area about 1,000 acres, on Copper Mountain, near Corbin. Development is by a 200' shaft, planned to be sunk 500', and drifts sent from bottom. Shaft encountered numerous stringers of ore, assaying 6% copper, with small silver values. Considerable diamond drill boring has been done also. Presumably idle.

COPPEROPOLIS MINE.**ARIZONA.**

Office: care of Dr. J. M. Ford, Phoenix, Ariz. Mine office: Briggs, Yavapai Co., Ariz. Emery W. Fisher, superintendent. Ores carry copper, silver and lead. Has gasoline power.

COPPEROPOLIS MINE.**MONTANA.**

A property at Copperopolis, Montana, owned by the Daly Mining Co.

COPPEROPOLIS COPPER CO.**OREGON.**

Office: 503 McKay Bldg., Portland, Ore. Mine office: Prairie City, Grant Co., Ore. Employs 10 men. W. W. Gibbs, president and general manager; H. W. Prettyman, vice-president; M. A. Butcher, secretary; Donald Ross, treasurer. Organized 1900, under laws of Oregon, with capitalization \$120,000, shares 10 cents par. Lands 10 claims, 2 patented, area 200 acres, with a 2-acre millsite, in the Quartzburg district, showing two fissure veins, between diorite and porphyry, of which one, of 60' estimated average width, is opened by a 1,500' tunnel, showing chalcopryrite giving average assays of 3% copper, 1.5 oz. silver and \$1.50 gold per ton. Has steam and gasoline power, with a 2-drill air-compressor. The mine has 8 buildings, including a 50x60' frame concentrator, equipped with crusher, rolls and jigs,

COPPEROSITY MINE.**ARIZONA.**

Mine office: Vekol, Pinal Co., Ariz. Idle.

COPPER PLATE & ARIZONA MINING CO.**ARIZONA.**

Mine office: Metcalf, Graham Co., Ariz. A. Burke, superintendent. Organized, 1904, by Duluth, Minnesota, parties with capitalization \$5,000,000, to take over the Copper Plate Group, on Chase creek, said to show a 5' vein of milling ore in the breast of a 200' tunnel.

COPPER PRINCE GROUP.**ARIZONA.**

Sundry claims, in the Eureka district of Yavapai county, Arizona.

COPPER PRINCE MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Kingman, Ariz.

COPPER PRINCE CONSOLIDATED MINING CO.**UTAH.**

Office: care of Clarence K. McCornick, vice-president, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. Anthony O. Jacobson, president; Chas. H. Post, secretary. Organized 1904, with capitalization \$500,000, shares \$1 par. Lands, 3 groups of claims, near the Continental-Alta and Columbus Consolidated, from which \$900,000 worth of ore has been shipped in the past.

COPPER PRINCE MINING CO.**CALIFORNIA.**

Office: care of J. C. Ruddock, secretary, Ukiah, Cal. Mine office: Middleton, Lake Co., Cal. E. Lobree, president. Lands, 3 claims, opened by tunnel and trenches. A vein of 6' to 8' width, in limestone, has given assays of 5% copper, 1 oz. silver and \$3 gold per ton. Presumably idle.

COPPER QUEEN CONSOLIDATED MINING CO.**ARIZONA.**

Office: 99 John St., New York. Mine office: Bisbee, Cochise Co., Ariz. Works office: Douglas, Cochise Co., Ariz. Employs about 4,000 men, approximately 1,500 at the smelter and 2,500 at the mine. Jas. Douglas, president; D. Willis James, vice-president; Geo. Notman, secretary and treasurer; Walter Douglas, general manager; S. W. French, assistant manager; Gerald Sherman, mine superintendent; S. W. Clawson, mine foreman, Geo. B. Lee smelter superintendent; W. F. Crane, auditor. Organized August, 1885, under laws of New York, with capitalization \$2,000,000, shares \$10 par. Is a close corporation, said to have but 14 shareholders.

The mine was opened, 1880, on a solid outcrop of oxidized copper, iron and manganese, opposite the Copper Queen hotel in Bisbee. The original ore body, which has been removed, leaving a large artificial cave, gave average returns of 23% copper and was smelted in a 30" water-jacket furnace, with English coke, brought via San Francisco, but was exhausted in three or four years, and the mine had many ups and downs, until additional and far larger ore bodies were developed, by following seams and stringers of ore wherever occurring, these almost invariably leading to further large and rich ore deposits. The formation of the Copper Queen, and other mines of the district, consists essentially of two dolomitic limestone beds, of Carboniferous age, the upper white and the lower blue, dipping to the southward and flanking a granite-porphry core, with intrusive porphyritic masses. Until 1902 the principal ore bodies were found at the base of the upper lime-

stone bed, which is much broken and interrupted by feldspathic, igneous, intrusive rocks, that evidently have a considerable bearing upon the ore deposits, which occur in pockets, lenses, chimneys, bunches, chutes, veins, stringers, seams—in fact in almost every manner possible, the larger bodies being connected in most cases by small veins, or mere knifeblade seams. The limestone and its included ore bodies have a general pitch to the southeast, somewhat sharper than the pitch of Tombstone Canyon, necessitating deeper and deeper shafts, as distance is made toward the southeast. Extensive bodies of high-grade ore have been found, since 1902, in the underlying limestone strata, and developments prove these underlying ore bodies to be persistent to great depth. All of the Copper Queen's deep shafts are bottomed in disseminated sulphide ores of high grade, consequently the depth of the ore bodies, while already proven great, is conjectural. The mines show numerous beautiful caves, lined with calcite, some of these being of considerable size, and frequently found in close association with good ore bodies. The alteration zone is variable and erratic, as rich oxidized ores have been found on the lowest level, with chalcocite and bornite occurring above azurite, malachite, cuprite and even considerable bodies of native copper. The larger masses of native metal, ranging up to several hundred-weights, and even tons, have been found mainly, not in the upper levels, as might have been expected, but at considerable depth. There is much talc and hematite, with frequent occurrences of manganese, in connection with the ore bodies. Only oxidized ores were worked, until 1893, when converters were added to the smelting plant, since which time the furnaces are charged with a mixture of oxide, carbonate and sulphide ores, perhaps one-third of the charges being sulphide ores, the ores smelted giving average returns of better than 7%. The system of assaying used by the mine gives no figures regarding ores richer than 15%, and the frequent occurrence of the figures "15+," on the assay books of every shaft, testifies to the wonderful richness of the ore bodies.

Mining lands are upwards of 1,000 acres, in the Warren district. The various shafts of the mine range from 400' to 1,200' depth, and there are five producing shafts, these being the Czar, Holbrook, Spray, Lowell and Gardner, with two developing shafts, the Sacramento and Cuprite, and one idle shaft, the White Tail Deer, also a number of old and small exploratory shafts and pits. The mine is opened ahead for about eight years, and for several years, until 1905, the bulk of the ore smelted came from development work only, the present ore reserves of the mine being among the richest and most extensive ever developed in any property. The ores are so soft that securing the mine openings is a serious problem, as the entire hill above the mine is creeping, and serious crushes can be avoided only by heavy timbering and the exercise of great care. Many of the lower stopes are bulkheaded throughout. The mine is timbered with square sets of 10x10" and 12x12" timber, mainly Washington fir, costing \$22 per thousand, and an average of 30' of timber, board measure, is required for each ton of ore won. All ore is hand-sorted underground, after breaking, and culls used for filling in worked-out stopes,

this material standing remarkably well. That the mine, operated under these numerous disadvantages, and menaces to life, is one of the safest in existence for underground workmen, evidences an able and experienced management.

The Czar shaft is the oldest of the present workings, and the principal shops are clustered about this shaft, on a narrow bench of ground made by grading the steep hillside. The Czar is connected underground with the Holbrook, Spray and Gardner shafts, and ultimately all shafts will have numerous connections. The old smelting plant was crowded and inadequate, notwithstanding which it earned many millions of dollars for the Copper Queen company, in the past, doing much better work than its appearance promised.

Lying next southeast of the Czar is the Holbrook shaft, an old and reliable producer that carries very rich ores, and is excessively hot in the lower levels. Considerable trouble is experienced from the settling of ground in the Holbrook openings. Enormous new ore bodies have been opened and developed since 1902, and the Holbrook is the principal producer of the mine. The six-compartment shaft is 500' deep, with a 100' winze from the bottom level. Surface equipment includes a steel gallows-frame and 750-h. p. hoist.

Next southeast, and near the Irish Mag shaft of the Calumet & Arizona, is the Silver Spray, commonly known as the Spray shaft, 950' deep, with three compartments, two carrying 3-deck cages for ore-cars, with a man-way and pipes in the third. The pump station is on the 700' level. This shaft shows rich ores from the fourth level to the bottom, the upper workings carrying mainly chalcocite, which changes to bornite on the fifth level, with carbonates, oxides and a continuance of sulphide ores shown on the sixth level, both oxidized and sulphide ores occurring on the seventh, and with mainly sulphide ores on the eighth level. The ore bodies are very extensive and persistent, but most erratic in nature, with frequent occurrence of porphyry dykes. A considerable body of native copper was cut on the 700' and again on the 800' level, thus setting at defiance some deeply cherished geological theories regarding ore deposition. The pump station is on the 700' level, and the Spray has underground connection with the Gardner shaft. Surface plant includes a 20x60" Nordberg Corliss hoist.

The Lowell shaft, southeast of the Irish Mag of the Calumet & Arizona, sunk on a property bought in 1901, is 1,120' in depth, and underground connections have been secured with the Gardner and Sacramento shafts, for safety and ventilation. No important ore bodies have been opened above the 900' level, but very large lenses of high-grade sulphide ore have been developed on both the 1,000' and 1,100' levels. The 1,000' level shows high-grade oxides occurring below sulphides. This shaft makes about 175,000 gallons of water daily, which is forked to surface by a Prescott station pump, on the 1,000' level. The Lowell became a producer in 1904, and has shipped carloads of ore giving smelter returns of 55% copper. The average of the mine is much lower, of course, but is remarkably high. A new 20x60" Nord-

berg Corliss hoist, similar to those at the Gardner and Spray shafts, is being installed, and will operate three-deck cages.

The Gardner shaft, near the porphyry contact, is 1,100' deep, with three compartments. Large bodies of high-grade sulphide ores, similar to those of the Lowell, are being developed. The surface equipment includes a 100' steel gallows-frame and 20x60" Nordberg Corliss 750-h. p. hoist, similar to those at the Gardner and Spray shafts.

The 3-compartment Sacramento shaft, 2,200' from the Lowell, started 1904, is sunk on Sacramento Hill, the keystone of the Bisbee copper deposits, and has underground connection with the Lowell, for ventilation and safety. The hoist in use is the old engine from the Lowell.

The Cuprite shaft, lying about 1,400' west of the Holbrook and Spray, was started 1905, and was 200' deep in March, 1906. This shaft should cut the extension of the ore bodies opened in the Shattuck-Arizona property.

The White Tail Deer shaft lies some distance south of the main workings, and is reached by road only by a detour of several miles. This shaft was opened on an incline, circa 1893, to a depth of 100', and the product was hauled to the smelter by a traction engine. Some high-grade ore, shipped by lessees, 1903 and 1904, ranged 12% to 15% copper, and the mine shows a large body of low-grade ore.

A precipitating plant is being built near the old smelter, to treat the water from the Czar shaft, which is heavily charged with copper sulphate in solution. The two monstrous slag-dumps at Bisbee are being broken up, and slags shipped to Douglas, for resmelting.

Fuel for power purposes, at the mine and smelter, is mainly Texas and California petroleum, consumption amounting to about 400,000 gallons monthly. Petroleum has proven cheaper in initial cost, and easier and cleaner in handling, than coal, in addition to which a great saving of wages is effected by dispensing with the services of a large number of stokers. The shafts and shops are all reached by spurs of the El Paso & Southwestern Railway.

The Douglas Reduction Works, at Douglas, Arizona, 28 miles from the Copper Queen mine, and within a mile of the Mexican border, were designed as the central smelter for the mines of Phelps, Dodge & Co., in Arizona and Mexico, these including the Copper Queen at Bisbee, the Detroit at Morenci, the United Globe and Old Dominion at Globe, the Moctezuma at Nacozari, Sonora, and the Sierra de Cobre at La Cananea, Sonora, Mexico. As these six properties produce a great diversity of copper ores, including those of practically every grade and character found in the southwest and in northern Mexico, it is possible, by means of this central reduction plant, to take the fullest advantage of the varied nature of the ores in mixing the furnace charges. This plant also treats custom ores of copper, gold and silver, and is smelting the ore of the Imperial mine, among others.

The smelting plant, which cost about \$3,000,000, is second in size only to the mammoth Washoe works of the Anaconda. Construction was begun May, 1901, and the first stack was blown in, March, 1904. The works are

constantly being increased in size, although originally planned to do for a generation, without additions. Present daily capacity is about 3,000 tons, which is to be increased.

The works have 15 miles of railroad, including main line and side-tracks. Ore is received from the mine in side-dumping steel cars, and discharged into 3 ore pits, each 12' deep, 38' wide and 765' long, lined with white tufa, these pits being of 10,000 tons capacity each. Ore is removed, as needed, by steam shovels. Adjoining the furnace building is a steel trestle, 48' high and 1,343' long, divided into sections, with bins for coke, fluxes and silica. Ore storage facilities were increased 50% in 1905.

A sampling mill, 75x160', built 1905, is supplied with a most complete and modern equipment.

The steel furnace building, originally 150x396', was greatly increased in size in 1905. This originally had five 42x204" water-jacket blast-furnaces, of 250 tons daily capacity each, but these were being torn down in the spring of 1906, and enlarged to 350 tons capacity each. Three 42x120" blast-furnaces, from the old smelter at Bisbee, have been installed in the western end of the new plant. Three new 42x240" furnaces, of 350 tons daily capacity each, are being added, the first of these being blown in, December, 1905. Each blast-furnace has a separate settler. In addition to the blast-furnaces, there are to be three large reverberatory furnaces, to treat the blast-furnace slags, flue-dust and fines, the first of these being installed in the slag-yard south of No. 6 blast-furnace.

Molten matte is taken from the blast-furnaces to converters by two 60-ton electric traveling cranes, each of which has two 15-ton auxiliary hoists. Capacity of the converter plant was increased, 1905, to seven stands, equipped with monstrous shells of the Copper Queen horizontal barrel type, each 96x136". Blast for the converters is furnished by six 30x42" Nordberg cross-compound duplex condensing air-compressors. A new blast-main has been installed for the converter blast, the six compressors having an aggregate capacity of 45,000 cubic feet of free air per minute. The converter department is supplied with a silica-mill and briquetting plant. The main stack of the furnace building is 30' diameter at the base, 25' at the top, and 200' high.

The steel power-house, enlarged, 1905, to 210x250', has 17 engines of various sizes and types, for various uses, with an aggregate of about 6,000 horse power. The plant includes blowers for the blast furnaces, air-compressors for the converters, and a cross-compound two-stage condensing air-compressor, with capacity to reduce 2,000 cubic feet of free air per minute to 100 lbs. pressure per square inch. The electric plant has four 250-volt 400-kw. direct current generators, supplying power for the traveling cranes, slag-locomotives and electric light. Slags from the blast-furnaces are handled by electric locomotives, hauling dump-cars traversing standard-gauge railroad tracks.

An 85x208' steel boiler-house has six 500-h. p. and one 1,000-h. p. Stirling water-tube boilers, with a Green fuel economizer, and a Foster super-

heater designed for 90,000 lbs. of steam per hour. The boilers are arranged to burn either coal or petroleum, but the latter is used almost exclusively. The main stack of the power-house is of brick, 13' in diameter and 177' high, surmounted by 4 lightning-rods.

The 80x204' machine-shop, of steel, is fitted with a very complete line of shop tools, and is equipped to handle the heaviest work. The 85x120' boiler-shop, of steel, is calculated to do any work required, and, if necessary, can repair locomotives. In connection with the boiler-shop is a large smithy, also thoroughly equipped. An 80x120' foundry is prepared to turn out castings of all size, from the smallest to those of many tons in weight.

Water for the smelting plant is secured from artesian wells, and a flowing well was brought in, late in 1905. A large reservoir and cooling tower have been constructed for the water.

The El Paso & Southwestern railroad, owned by Phelps, Dodge & Co., which serves the Copper Queen mine and smelter, has some 300 miles of main lines, with considerable trackage in spurs and sidings, and while designed solely as an outlet for the Phelps-Dodge mines, has developed a previously inaccessible district, rich in natural resources, and its business has increased in a manner astonishing to even the most optimistic. One result of the construction of this line is the building of the new town of Douglas, named in deserved honor of Prof. James Douglas, which is a bustling young metropolis of some 9,000 souls, apparently destined to become a strong competitor of El Paso, as a custom smelting point for the ores of Arizona, New Mexico, Sonora and Chihuahua.

The miscellaneous enterprises of the Copper Queen include a sawmill in the Chiricahua Mountains, and an enormous department store that carries a stock and does a business that would do credit to any city of several times the population of Bisbee. There is, however, no compulsion of the employees, who are at perfect liberty to buy their goods at any of the numerous independent mercantile establishments. The company maintains a large and well equipped hospital, a fine four-story hotel, a large library and reading room, and a handsome three-story gymnasium supplied with baths, bowling alleys and having a large auditorium, in which scientific and popular lectures are given frequently.

Relations of the Copper Queen with its workmen are notably cordial. The wages of underground workmen are \$3.50 to \$4.00 per day, for eight-hour shifts, and these wages and hours were established voluntarily, many years before the first miners' union was heard of in the southwest. The Queen has been free from labor troubles, of any sort, for almost a generation. Efforts have been made at various times to unionize the camp, but early in 1906 a referendum vote of the mine workers of Bisbee was taken on this point, no bosses or other salaried employees being allowed to vote. The polling was conducted on the Australian system, with complete poll-lists, inspectors and guards, the voting being surrounded by all the safeguards found at a political election. The vote of the miners of the Copper

Queen, Calumet & Arizona and other mines of Bisbee, was more than five to one against forming a union of the Western Federation of Miners.

The smelter, which runs three eight-hour shifts, has a possible capacity of 10,000,000 lbs. to 12,000,000 lbs. fine copper monthly, and in January, 1906, the production was 7,696,000 lbs. fine copper, this including the product of refractory ores from Globe, Imperial ores and Nacozari concentrates, as well as the ores of the Copper Queen. The two old slag-piles at Bisbee, containing approximately 1,000,000 tons running about 2% copper, are being broken up and resmelted. The new reduction plant, which was planned in 1901 to care for the company's business for decade or two, without enlargement, has been nearly doubled in size since going into commission, in 1904, and the end of its rapid growth does not seem to be in sight as yet, the Copper Queen alone being capable of a production of nearly or quite 100,000,000 lbs. fine copper yearly. Production, 1905, was 64,570,847 lbs. fine copper.

The broad and generous management of the Copper Queen mine cannot be too highly commended. This is shown, not only in the technical skill with which the properties are managed, but also in the relations of the company with neighboring mines, with its employees, and with the townspeople of Bisbee and Douglas. The railroad controlled by the same management has been of incalculable benefit in building up the resources of the territory along its line, and new enterprises have been fostered by the giving of low freight-rates, and by aid of a practical nature in other directions. The public spirit and philanthropy of the company are shown by its liberal donations to all local enterprises, and by the aiding of every movement calculated to promote the mental, moral and material welfare of the two cities, with an aggregate population of 25,000 people, that have grown up about its mines and smelters.

COPPER QUEEN CONSOLIDATED MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Dillon, Wyoming.

COPPER QUEEN CONSOLIDATED MINING & MILLING CO.

Office: 500 Auerbach Bldg., Salt Lake City, Utah. Moribund.

COPPER QUEEN GROUP MINING CO.

COLORADO.

Office: care of B. S. Koll, 723 Odd Fellows Bldg., St. Louis, Mo. Capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, in the Elk Mountain district, Gunnison county, Colorado. Has been idle several years, but it is planned to develop the property through extension of a tunnel being driven by the Success Gold Mining Co.

COPPER QUEEN, LTD.

BRITISH COLUMBIA.

Dissolved, August, 1904.

COPPER QUEEN MINE.

ARIZONA.

Letter returned unclaimed from former mine office, Riverside, Ariz.

COPPER QUEEN MINE.

ARIZONA.

Mine office: Stoddard, Yavapai Co., Arizona. Has a tunnel showing auriferous copper ore. Presumably idle.

COPPER QUEEN MINE.**BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Idle for several years.

COPPER QUEEN MINE.**CALIFORNIA.**

Office: care of Joseph Hutchens, owner, Anada, Cal. Lands, 6 claims, 35 miles southeast of Bridgeville, Humboldt county, California, developed by open-cuts and a 40' shaft, showing sulphide ore.

COPPER QUEEN MINE.**CALIFORNIA.**

Office and mine: care of G. H. Hamstadt, Nipton, San Bernardino Co., Cal. Property has made several small shipments of selected high-grade ore.

COPPER QUEEN MINE.**CALIFORNIA.**

An idle property, opened by a 350' tunnel, in the Pit River district, Shasta county, California.

COPPER QUEEN MINE.**COLORADO.**

A prospect in Larimer county, Colorado, near the Wyoming line, opened by a 95' shaft showing a 3' vein of chalcopryite of smelting grade. Is developing with a small force.

COPPER QUEEN MINE.**COLORADO.**

Lands, 180 acres, on Sultan Mountain, San Juan county, Colorado, opened by a 70' tunnel, following the contact, which shows ore assaying 15% copper and \$25 gold per ton, with small silver values.

COPPER QUEEN MINE.**NEW MEXICO.**

Mine office: Jarilla, Otero Co., N. M. Wm. Wade, manager. Lands, sundry claims in the northern part of the Jarilla Mountains, which, at the close of 1905, were showing ore assaying 5% to 10% copper, with small gold and silver values.

COPPER QUEEN MINE.**SOUTH DAKOTA.**

A prospect, near Custer Peak, South Dakota, on which an 80' shaft shows some ore of fair grade.

COPPER QUEEN MINING CO.

Dead. Former office was 542 Rookery Bldg., Spokane, Wash.

COPPER QUEEN MINING CO. OF ALASKA.**ALASKA.**

Neither office nor lands located.

COPPER QUEEN MINING CO., LTD.**ONTARIO.**

Succeeded, 1905, by Calumet & Algoma Mining Co.

COPPER QUEEN MINING & SMELTING CO.**IDAHO.**

Office: 409 Providence Bldg., Duluth, Minn. Mine office: Grant, Beaver head Co., Mont. Employs 18 men. T. E. G. Lynch, president; B. F. White vice-president; A. J. McLennan, secretary and treasurer; Geo. H. Crosby, general manager; A. K. McDaniel, superintendent; preceding officers, Dr. C. W. McFadden and J. C. McFadden, directors. Organized June 12, 1905, under laws of Arizona, with capitalization \$500,000, shares \$1 par. Lands, 8 claims, area circa 150 acres, carrying 8 fissure veins in schistose quartzite, of which 3 are more or less developed, these ranging from 15" to 15' average width, showing chalcocite, bornite and occasional chalcopryite, giving average assays of 15% copper, 5 oz. to 10 oz. silver and \$15 gold per ton. Development is by shafts of 100' and 140', and by tunnels of 30', 50', 75', 110', 160', 180' and 425'.

Equipment includes a steam plant with 3 boilers, 2 hoists, 3-drill Rand air-compressor and 2 power drills. There are 10 buildings, including a log mill having 5 gravity stamps, 2 concentrators and 6 canvas tables. Property is 38 miles from the Oregon Short Line railway. Company plans continuing development work underground, and installing a 100-ton concentrator. Management is good and property is regarded as promising.

COPPER RANCH GOLD MINING & MILLING CO.

COLORADO.

Office: 1711 Tremont St., Denver, Colo. Capitalization \$1,000,000, shares \$1 par. Lands, 170 acres, patented, in Boulder county, Colorado, opened by a 218' shaft, with 350' of drifts. In February, 1906, was advertising its property as a tungsten mine.

COPPER RANCH MINING CO.

UTAH.

Office: 323 D. F. Walker Bldg., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Milford, Beaver Co., Utah. Moses Thatcher, president; C. L. Rood, vice-president; Benj. T. Lloyd, secretary and treasurer. Organized under laws of Utah, with capitalization \$500,000, shares 50 cents par. Lands, 17 claims, area circa 340 acres, between the Old Hickory and O. K. mines of the Majestic company, carrying about 2 miles of outcrop along the strike of the vein, which apparently is about 100' wide, and has been developed, at intervals, for a distance of about one mile. Assays have ranged from 7% to 43% copper, 7 oz. to 10 oz. silver and \$2.25 to \$8 gold per ton. It is estimated by the management that the entire vein will average 4% to 7% copper, with fair gold and silver values. Idle, and lacks funds for development. Property regarded as valuable, if properly financed and managed.

COPPER RANGE CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; preceding officers, Chas. A. Snow, Jas. H. Seager and Cameron Currie, directors; F. W. Denton, general manager. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Is controlled, through ownership of 99,674 shares out of 100,000, by the Copper Range Consolidated Co. Holdings of the Copper Range Co. consist of 50,000 shares Champion Copper Co., being one-half the total issue, 26,051 shares Copper Range, R. R. Co., 9,360 acres of mineral lands, sundry timber lands, bought for \$73,560.88, and a millsite. Company's income, for 1905, was \$514,472.28, of which \$500,000 came from dividends of the Champion Copper Co., and disbursements included \$172,006.49 for bills payable redeemed, and \$300,000 in dividends, later being \$1.50 per share, Oct. 4, 1905, and \$1.50 per share, Dec. 21, 1905. Company ended 1905 with \$34,060.87 cash on hand, and with liabilities of only \$2,139.70.

Landed holdings include 9,360 acres, in a compact tract south of the Baltic mine, in Town 54 North, Range 34 West, and Town 54 North, Range 35 West, including 9,360 acres on the mineral belt, south of the Baltic, something more than 5,000 acres being located on the mineral belt. The company also holds an option on 2,000 acres of mineral land owned by St. Mary's Canal Mineral Land Co., in the immediate neighborhood of its own holdings. Miscellaneous

lands include 441 acres, with nearly 4 miles frontage on Lake Superior, near the mouth of the Graveraet river, 3 miles southwest of the Champion mill, at Freda, sufficient to give sites to three or four new stampmills.

COPPER RANGE CONSOLIDATED CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Railroad office: Houghton, Houghton Co., Mich. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; F. W. Denton, general manager of mines; preceding officers, Cameron Currie, J. Henry Brooks, R. Townsend McKeever, Samuel L. Smith, Chas. H. Paine and Kenneth K. McLaren, directors; John M. Wagner, purchasing agent.

Organized November, 1901, under laws of New Jersey, and capitalization increased, 1903, to \$38,500,000, shares \$100 par; issued, \$38,413,500. Is a securities holding corporation, owning only stock in subsidiary companies, these including the Copper Range Co., Copper Range Railroad Co., Baltic Mining Co. and Trimountain Mining Co., all of which are practically owned outright, also a one-half interest in the Champion Copper Co. and a large interest in the Michigan Smelting Co., and control of the Globe mine, now undergoing development. All of the subsidiary corporations heretofore named are separately described, under their respective titles. Company's balance sheet, of Jan. 1, 1906, showed stockholdings as follows: 99,674 shares Copper Range Co.; 13,986 shares Copper Range, R. R. Co.; 99,659 shares Baltic Mining Co., and 791 unissued shares of Copper Range Consolidated Co., latter held subject to issue in exchange for outstanding shares of the Baltic Mining Co. and Copper Range Co. Assets also included \$615,000 bonds of Copper Range R. R. Co.; \$114,000 notes of Champion Copper Co.; \$188,350.15 notes of Michigan Smelting Co., and \$100,000 notes of Trimountain Mining Co. The balance sheet also included items of \$104,534.64 for the Globe mine, for expenditures made thereon; \$305,703.45 due from Trimountain Mining Co., apparently on open account; \$74,865.33 Trimountain Mining Co., indebtedness of Trimountain Mining Co. on surplus account, and a balance of \$540,542.49 due from former majority shareholders of the Trimountain Mining Co., under the merger agreement of Aug. 25, 1903. The balance sheet also showed \$34,032.91 in accounts receivable, and \$335,928.53 cash. Liabilities included Trimountain Mining Co., suspense, \$540,542.49; Trimountain Mining Co., on deposit, \$534,469.04; Baltic Mining Co., on deposit, \$151,762.50; Copper Range Co., on deposit, \$33,000 and Copper Range R. R. Co., on deposit, \$60,000, with a balance to Profit and Loss of \$1,091,753.47. Dividends were begun, 1905, and aggregated \$1,536,086 for the year. Disbursements included \$50,000 paid for an option on the Globe mine, and \$54,534.64 cash expended on exploratory and development work at the Globe.

Through its subsidiary corporations the Copper Range Consolidated Co. has become the second largest copper producer of the Lake Superior district, the production of the Baltic, Trimountain and Champion mines for 1905, having been 40,568,572 lbs. fine copper, of which amount the share of the Copper Range Consolidated Co. was 32,714,859 lbs. The mines controlled by this company are all young and vigorous, and have by no means reached the

limit of their productive capacity. The Globe may add a fourth big mine, but even though this be not accomplished, it is a reasonably safe assertion to state that the Baltic, Trimountain and Champion mines, collectively, carry more copper, and eventually will produce more copper, than the Calumet & Hecla mine proper, and should produce it at nearly as great a profit per pound. The management of the Copper Range is among the most aggressive and capable engaged in the copper industry, and future forecasts necessarily are of a most roseate hue.

COPPER RANGE RAILROAD CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Operating office: Houghton, Houghton Co., Mich. Wm. A. Paine, president; R. Townsend, McKeever, vice-president, general manager and assistant secretary and treasurer; Frederic Stanwood, secretary and treasurer; preceding officers, John H. Rice, Jas. H. Seager, Frank McM. Stanton, Rufus R. Goodell, Samuel L. Smith and Cameron Currie, directors. Organized 1899, under the laws of Michigan, with capitalization \$5,000,000, shares \$100 par; issued, \$4,093,700. Bonds outstanding, \$2,025,000, at 5%. Is authorized to issue bonds to the extent of \$20,000 per mile of completed main line and \$15,000 per mile of completed branch lines and side tracks. Road has 105 miles of main line and branch track, main line running from Calumet to Mass. Connections are with the Keweenaw Central line at Calumet, Duluth South Shore & Atlantic, Mineral Range and Hancock & Calumet lines, at Houghton and Hancock, and with the Chicago Milwaukee & St. Paul line, at Mass. The district between Houghton and Mass was practically a wilderness, for 38 of the 42 miles, when the Copper Range Railroad was built, in 1899, but is now well populated, and the road is running a suburban train service from Houghton to towns occupying sites that were covered by the forest primeval when this road was constructed. The bulk of the freight business of the line is in the carrying of copper rock from the mines to the mills, but in addition large shipments of timber, fuel and general merchandise are carried, and the passenger business has developed phenomenally. In addition to the main line, the two principal branches are the Painesdale branch, reaching the Baltic, Trimountain and Champion mines, and the Lake Shore branch, serving the stamp-mills along the shore of Lake Superior. Equipment includes 20 locomotives and 346 cars of various types.

The company owns a half interest in a railroad bridge crossing Portage Lake, between Houghton and Hancock. An extensive water frontage on Portage Lake, in the western part of Houghton, is improved by a two-story stone and brick general office building, shops, roundhouse, warehouses and wharves for merchandise and coal. The coal wharf is equipped with modern unloading machinery, and has deep water alongside, being capable of accommodating the largest freighters plying the great lakes.

To Dec. 31, 1905, the railroad cost \$5,642,593.25, with an outlay of \$551,048.77 for equipment. Earnings, for 1905, were \$498,361.27 from freight, \$113,279.01 from passenger service, and \$47,612.58 from miscellaneous sources, giving a total income of \$659,252.86, with total operating expenses of \$378,261.13. Taxes and interest on bonds amounted to \$123,259.06,

leaving surplus earnings of \$157,732.67, equal to nearly 4% on the outstanding share capital. The road is in fine physical condition, and the manner in which it has been developed is a great credit to its management.

COPPER RIVER MINING CO.**ALASKA.**

Office: 1347-25 Broad St., New York. F. M. Bradshaw, president; F. C. Helm, secretary and treasurer; preceding officers, Hon. W. F. Bay Stewart, Hon. Robt. Gwynne, Jr. and John Q. Denny, directors. Capitalization \$50,000,000. Lands, alleged to be 188 claims, area 2,360 acres, and also lays claim, without the slightest ground, to 12 other claims, area 240 acres, owned by the Alaska Copper & Coal Co. Lands, if any, are located about 185 miles inland, by trail, from Valdez, Alaska, and are claimed to have "plenty of wood and water, with coal in the vicinity," the timber being a sparse growth of spruce and cottonwood, and the coal lignite. Properties claimed by this company include the Bonanza, Nicholai, Kinnecot and Jumbo groups. The Bonanza group, as before stated is not owned by the Copper River Mining Co. The Kinnecot group has 31 claims, 5 miles from the headwaters of the Kinnecot river, in the Kinnecot mountains. The Nicholai group, 7 claims, 7 miles from the Kinnecot, is said to show a fissure vein. Company and its alleged property are fully described in Vol. IV. The Copper River Mining Co. is a brazen swindle, and its promoters should be in jail.

COPPER ROCK GOLD MINING &**COLORADO & WYOMING.****MILLING CO.**

Office: 105 North 7th St., St. Louis, Mo. Mine offices: Sunset, Boulder Co., Colo., and Encampment, Carbon, Co., Wyo. H. Lee Servos, president; Dan G. Kirshbaum, secretary and manager; Emory Young, superintendent. Capitalization \$1,500,000, shares \$1 par. The Colorado property, 60 acres, in the Sugar Loaf district, near Sunset, has a 300' shaft, showing ores carrying good assay values in copper, gold and silver. The Wyoming property, 120 acres, known as the Copper Link group, has a 200' shaft, showing a little leached ore, with an 8x10" hoist, and a sawmill, and is sinking a new shaft. The Wyoming claims are considered promising.

COPPER ROCK & GOLD QUARTZ MINING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Bisbee, Cochise, Co., Ariz. Lands, sundry claims on the porphyry side of Tombstone cañon, on which only annual assessment work has been done.

COPPER SECURITIES CO.**MONTANA.**

Office: 42 Broadway, New York. F. August Heinze, general manager. Organized, 1905, under laws of New Jersey, with capitalization \$10,000,000, shares \$10 par. Holds one-half the stock issue of La France Copper Co., and presumably is to take the balance. Was organized solely as a securities holding corporation.

COPPER SELECTION SYNDICATE, LTD.**AUSTRALIA.**

Offices: Broad Street House, London, E. C., Eng. Organized August 22, 1902, with capitalization £15,000, in 14,000 ordinary £1 shares and 20,000 deferred 1s. shares. Property was options on sundry mining and smelting properties, in New South Wales. Apparently moribund.

COPPER STAR MINING CO.**COLORADO.**

Dead. Eugene B. Estes was president, and Edwin Wallace secretary and general manager. Paid dividends while peddling stock, and smashed, like all other companies that are rotten before they are ripe.

COPPER STATE MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Wyo.

COPPER STATE & RED METAL CLAIMS.**MONTANA.**

Mine office: Stone, Granite Co., Montana. Are said to show ore assaying 17% copper. Idle.

COPPERTOWN MINING & SMELTING CO.**CALIFORNIA.**

Office: 211 Examiner Bldg., San Francisco, Cal. Mine office: Hornitos, Mariposa Co., Cal. C. H. Street, president; T. J. Kerrigan, superintendent. Capitalization \$250,000, shares \$1 par. Property is known as La Victoria mine, which has 3 shafts, each of about 200', also a 400' tunnel. Vein matter, with a heavy gossan capping, 300' to 600' wide, is of schistose diabase, between grano-diorite walls, showing cuprite, malachite, azurite, bornite and tetrahedrite. All ores, including the gossan, are more or less auriferous. Was a considerable producer, circa 1865, employing 300 men. Company also owns the Hope mine, near Sonora, Tuolumne county, California, which is a gold mine with a 10-stamp mill.

COPPER TRUST, LTD.

Offices: 20, Laurence Lane, London, E. C., Eng. Organized December 9, 1905, with capitalization £50,000, shares £1 par. Apparently owns no mining property.

COPPER TRUST MINING CO.

Letters returned unclaimed from former office, Plankinton Bank Bldg., Milwaukee, Wis.

COPPER VEIL MINING CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. Lands, said to be 52 claims, with 6 tunnels, longest 250'.

COPPER VENTURE SYNDICATE, LTD.

Voluntarily liquidated, June, 1905.

COPPER VERDE MINE.**COLORADO.**

Office: care of G. W. Chance & Co., Philadelphia, Pa. Lands, sundry claims on the Colorado Midland railway, 9 miles from Lake George, Park county, Colorado, said to show a large body of auriferous copper ore.

COPPER WORLD EXTENSION MINING CO.**WASHINGTON.**

Office: 503 New Hayden Bldg., Columbus, Ohio. Mine office: Loomis, Okanogan Co., Wash. Employs 20 men. Walter A. Boyle, president; Edw. H. Caylor, vice-president; Alfred F. Carman, secretary and treasurer; Henry Bahrs, superintendent; preceding officers, Saml. Bachtell and Clarence E. Ferree, directors. Organized January, 1905, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Lands, 8 claims, area 160 acres, on Palmer Mountain, in the Wannicut Lake district, showing a very wide ore body, estimated by company to be 100' to 300' in width, opened by a 210' shaft, with south crosscut on the 210' level showing a 17' body of chalcopyrite of apparently

about 8% average tenor. Main working shaft has two compartments. Ores carry 4 oz. silver and \$1.40 gold per ton, and upwards. Has a steam plant with 2 hoists, good for 500' each, and a 5-drill air-compressor. Lands are surveyed for patents. Management seems good, and property is considered promising.

COPPER WORLD GOLD MINING CO.**WASHINGTON.**

Office: care of Jerome L. Drumbeller, Spokane, Wash. Mine office: Loomis, Okanogan Co., Wash. John Wentworth superintendent. Apparently succeeded the Copper World Mining & Smelting Co. Lands, sundry claims on the apex of Palmer Mountain, lying between lands of the Copper World Extension and Leadville mines, $4\frac{1}{2}$ miles northeast of Loomis, showing a 100' gossan, with iron pyrites near surface and chalcopyrite at a little depth. Has several shallow shafts and short tunnels, showing ore giving assay values of \$10 to \$15 per ton, in copper, gold and silver.

COPPER WORLD MINING CO.**CALIFORNIA.**

Dead. Described in Vols. IV. and V.

COPPER WORLD MINING CO.**NORTH CAROLINA.**

Merged, 1903, in Carolina King Mining Co.

COPPER WORLD MINING & SMELTING CO.**WASHINGTON.**

Apparently succeeded by Copper World Gold Mining Co.

COPPER ZONE MINING CO.**NEW MEXICO.**

Dead. Company was dispossessed of its lands.

SOCIEDAD MINERA COQUIMBANA.**CHILE.**

Mine office: La Serena, Coquimbo, Chile. Property includes the Rosario, Socavon and other mines. Idle at last accounts.

CORRA-ROCK ISLAND MINING CO.**MONTANA.**

Property sold, 1906, to Butte Coalition Mining Co.

CORBIN COPPER MINING CO.**MONTANA.**

Apparently an incorrect title or else probably succeeded by Corbin-Montana Mines Co.

CORBIN MINE.**ALASKA.**

Office: care of Harry Corbin, Coppermount, Prince of Wales Island, Alaska. Lands are about half way between Coppermount and Sulzer. Mine shows high grade ore, in promising quantities, and some ore was shipped to the Coppermount smelter, in 1905. Employs 10 men.

CORBIN-MONTANA MINES CO.**MONTANA.**

Office: care of Clarence K. McCornick, vice-president and general manager, Salt Lake City, Utah. Mine office: Corbin, Jefferson Co., Mont. Arthur H. S. Bird, president; C. H. Post, secretary-treasurer; preceding officers, H. A. McCornick, and B. T. King, directors. Organized 1904, under laws of Utah, with capitalization \$600,000, shares \$2 par. Lands, sundry claims in the vicinity of Corbin, which were diamond-drilled in winter of 1904-5. Presumably idle.

MINA CORDENERA.**MEXICO.**

Mine office: Suaqui Grande, Sonora, Mex. W. S. Morrow, manager, at last accounts. Ores carry silver and copper. Has steam power and a 5-stamp mill. Presumably idle.

thing in the ore is turned into metals. By this simple plan, ore of the very lowest grade will return practically 100% in copper, gold and silver.

The discovery that an oxy-hydrogen flame, burned in a vacuum, will give a heat similar to that of the electric arc, will, of course, destroy all the industries that have been built up at Niagara Falls by the use of the electric arc.

Inasmuch as all values are extracted as chemically pure and condensed metals, (the condensation of metals being a new thing also) the gold and silver being pure bullion bars, all of the electrolytic refining plants of the world will be forced to go out of business.

It is evident that the mints of the United States and foreign countries have been run on very loose principles, as the product of the McGahan vacuumizer, as the inventor terms his new furnace, can be sent direct to the mints and coined "when properly tempered." Heretofore the coiners have not tempered the bullion bars used for coin, nor have they coined chemically pure gold and silver, but have alloyed the same. For thus debasing the currency, the Director of the Mint should be impeached. It is quite evident, from the wonderful discoveries made by Prof. McGahan, that all of the metallurgists from the time of Tubal Cain to Bessemer have been nincompoops, but it remained for that eminent scientist, Prof. F. L. McGahan, of the Arizona Independent Vacuum Smelting Co., with its head offices in that important metallurgical center, Ft. Smith, Arkansas, to demonstrate this fact, and to utterly demolish the entire fabric of science, by the most remarkable discoveries of this or any other century.

CORNELL GOLD, SILVER & COPPER MINING CO. NEW MEXICO.

Mine office: Silver City, Grant Co., N. M. Frank F. Ross, secretary. Lands, including the Owl mine, are in the Gold Gulch district. Idle.

CORNELL MINE. BRITISH COLUMBIA.

Under bond to Cordillero Mining Co.

MINA EL CORNETA. MEXICO.

Mine office: care of Henry Winninghoff, owner, San Miguel Mezquitil, Zacatecas, Mexico.

CORNETT MINE. CALIFORNIA.

Office and mine: care of H. W. Cornett, owner, Merced, Mariposa Co., Cal. Vein matter is schistose diabase, with a 3' paystreak carrying ore, mainly chalcoppyrite, assaying 17% to 23% copper, and \$2.25 to \$4.50 gold per ton. Idle.

CORNISH COPPER CO.

Office: care of Andrew B. Hardryx, New Haven, Conn. Organized December, 1903, under laws of Connecticut, with capitalization \$300,000.

CORNUCOPIA COPPER CO. OREGON.

Letter returned unclaimed from former mine office, Quartzburg, via Baker City, Baker Co., Ore. Presumably dead.

CORNUCOPIA GOLD & COPPER MINING CO. ARIZONA.

Mine office: Cherry, Yavapai Co., Ariz. E. R. Hotzenpiller, president, and general manager. Idle for several years.

CORNWALL COPPER CO.

Office: 71 Broadway, New York.

CORNWALL MINES.

Located in Ste. Genevieve county, Missouri, and were worked on a small scale, circa 1860. Ores are greater in variety than in quantity, those found including cuprite, melaconite, malachite, azurite, chalcocite, covellite, bornite, chalcopyrite, chalcantite and chrysocolla. Idle many years.

MISSOURI.**COMPAÑIA CORO CORO DE BOLIVIA.****BOLIVIA.**

Mine office: Coro Coro, La Paz, Bolivia. Works native copper, occurring in beds of conglomerate, and is the largest Bolivian producer, making yearly about 1,500 tons of mineral averaging 85% fine copper. A little cuprite and chalcocite occur also, and silver, found with the copper in native form, as at the Lake Superior mines, is an important by-product. Has steam power and a small smelter, employing several hundred men. The Chilean government plans building a railroad from Arica to La Paz, with a branch to Coro Coro. This railroad, when built, must prove a great stimulus to Bolivian copper mining.

CORONA CONSOLIDATED GOLD & COPPER CO.**ARIZONA.**

Office: Union Blk., Prescott, Ariz. Geo. H. Schuerman, president and general manager; Eugene Newman, secretary; M. B. Hazeltine, treasurer. Organized April 9, 1903, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 16 claims, area 320 acres, in the Turkey Creek district, showing 5 contact veins, between porphyry and schist, averaging 2' to 6' width, of which 3 are developed by 5 shallow shafts, deepest 80', and by several tunnels, longest 520', estimated to show 40,000 tons of carbonate and sulphide ores, with 6,000 tons blocked out for stoping, ore ranging 3% to 16% copper, 2 oz. to 12 oz. silver and \$5.50 to \$60 gold per ton. Idle since January, 1906, but hopes to raise funds for resumption.

CORONA COPPER CO.**WISCONSIN.**

Office: care of Frank A. Woodward, president, 512-60 State St., Boston, Mass. Is a reorganization of the Chippewa Copper Mining Co., with capitalization \$3,000,000, shares \$10 par. Lands, 1,600 acres, part owned in fee and part held under option, in Douglas county, Wisconsin, carrying the western extension of the Keweenaw copper belt. Has a 350' two-compartment main shaft, with about 2,000' of underground openings. Ores show average values of 0.74% to 3.5% copper. Estimates of ore reserves put out by the company are excessive.

CORONA GOLD & COPPER CO.**NEW MEXICO.**

Letter returned unclaimed from former mine office, Santa Rita, N. M.

CORONADO GOLD & COPPER MINING CO.**ARIZONA.**

Office: care of Chas. P. Myers, president and general manager, Prescott, Ariz. Lands, 14 claims, area 285 acres, including the Black Warrior group, in the Black Hills district of Yavapai county, Arizona, said to show considerable ore. Idle.

CORONADO MINING CO.**ARIZONA.**

Office: 52 Broadway, New York. Mine office: Metcalf, Graham, Co., Ariz. Wm. B. Thompson, president; J. W. Belches, vice-president; Wm. J. Palmer, secretary; Henry L. Westlake, general manager; John L. Scofield,

superintendent. Is controlled by the Shannon Copper Co., which owns 51% of the stock issue.

Lands, 23 claims, area 400 acres, adjoin the Detroit and Arizona mines, and carry what is supposed to be the extension of the famous Coronado vein. Development is by several short tunnels and shallow shafts, with a new 2-compartment working shaft on the Garnet claim, showing a good body of auriferous and argentiferous chalcopyrite, on the 200' level. The Emerald mine shows a large body of sulphide ore that has given average assays of about 9% copper. Property is regarded as promising.

NUEVA COMPAÑIA MINERA DE CORPUS CHRISTI.

MEXICO.

Mine office: Matehuala, San Luis Potosí, Mex. W. B. A. Dingwall, president and manager. Ores carry silver, lead, gold and copper. Principal development is by an 1,800' tunnel.

SOCIEDAD DE MINAS y FUNDICIONES DE CORRALES.

ARGENTINA.

Mine office: Chilcito, Rioja, Argentina. Has auriferous and argentiferous copper ores, with a 12-ton smelter, and gas power.

JOSÉ FRANCISCO CORREA.

CHILE.

Office and mine: San Fernando, Colchagua, Chile. Has steam power and a small smelter with, a matting furnace. Employed circa 100 men, at last accounts.

CORTLAND GOLD & SILVER MINING CO.

COLORADO.

Mine office: Ohio, Gunnison Co., Colo. Victor Reno, superintendent. Ores carry gold, silver, lead, copper and zinc. Has gasoline power.

CORUÑA COPPER CO., LTD.

SPAIN.

Offices: Dashwood House, London, E. C., Eng. Mine office: Pino Arca, Coruña, Spain. R. F. A. Malabar, secretary. Organized April 19, 1901, with capitalization £1,000,000, shares £1 par; issued, £906,782. Lands, 3,040 acres, including the Santiago mines, bought for £900,000 in shares. Property was promoted by the notorious Ernest Terah Hooley. Ores occur in immense bodies, carrying about 2% copper, and are said to be refractory. Property was undergoing a little development work only, at last accounts.

CORY BROS. MINING CO.

MONTANA.

Office: Helena, Deer Lodge Co., Mont. Lands, sundry claims on Beaver Creek, north of Helena, showing gold-copper ores.

COSTELLO COPPER CO.

ARIZONA.

Office: care of Martin Costello, Tombstone, Ariz. Organized August, 1903.

COW CREEK COPPER MINING CO.

WYOMING.

Address: care of Hiram C. Ridder, Denver, Colo. Location of property, presumably in Wyoming.

COXHEATH MINE.

NOVA SCOTIA.

Owned by Cape Breton Copper Co., Ltd.

CRACKER JACK MINE.

ARIZONA.

Mine office: Payson, Gila Co., Ariz. A. Lockwood, owner. Idle.

CREEDE COPPER MINING CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Has a contact vein between norite and schist.

CREPIN & RICHARDSON.**ARIZONA.**

Office and mine: Silver Bell, Pima, Co., Ariz. Lands, sundry claims south of the Imperial mine and within 7 miles of the Arizona Southern railroad. The formation is quartzite and limestone, showing a contact vein carrying copper sulphides, with limestone gangue.

CRESCENT COPPER CO.**COLORADO.**

Office: Edinboro, Pa. Mine office: Boulder, Boulder Co., Colo. Organized under laws of Colorado, with capitalization \$1,000,000, shares \$1 par.

CRESCENT COPPER CO.**UTAH.**

Mine office: Park City, Summit Co., Utah. Idle.

CRESCENT COPPER CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. G. E. Heber, superintendent. Lands, circa 100 acres, 7 miles from Encampment, adjoining the Kurtz-Chatterton mine. Has an 800' tunnel. Idle.

CRESCENT COPPER MINING CO.**ARIZONA.**

Office: care of Carl Clausen, president and general manager, Bisbee, Ariz. W. A. Eckerly, secretary. Organized 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$2.50 par. Lands, 12 claims, in Tombstone Cañon, about 2 miles northwest of Bisbee, showing oxide and carbonate ores, and small quantities of chalcocite and iron ore, with quartz gangue, claimed to give average assays of 19.1% copper and 41 oz. silver per ton, from a vein said to range 8' to 30' in width. Idle.

MINA EL CRESTON DE COBRE.**MEXICO.**

Said to be owned by J. J. McCullom and J. L. Sheppard, to show rich oxide and carbonate ores, and to be located in La Dura district of Sonora, Mexico, but letter addressed to La Dura returned by postmaster, with notation that no such property exists in that district.

CRISTOBAL COPPER MINING CO.**NEW MEXICO.**

Is said to have an 8' ore body, opened by a 100' tunnel, on lands in the South Fork district, Taos county, New Mexico.

CROESUS GOLD & COPPER MINING CO.**IDAHO.**

Office: Beatrice, Neb. Mine office: Hailey, Blaine Co., Idaho. W. G. Page superintendent. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill. Presumably idle.

CROFTON SMELTER.**BRITISH COLUMBIA.**

Owned by Britannia Smelting Co., Ltd.

CRONA COPPER CO.**COLORADO.**

Office: Clay Centre, Kan. Mine office: Lyons, Boulder Co., Colo. Chas. A. Southwick, president; C. W. Strong, secretary and treasurer. Organized, 1901, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par. Lands, 14 claims, 2 miles from Lyons.

CRONNEBANE MINES.**IRELAND.**

Owned by Ovoca Copper Syndicate, Ltd.

CROWL CREEK COPPER MINING CO.**AUSTRALIA.**

Mine office: Shuttleton, Nymagee district, New South Wales, Australia.

J. Booth, manager. Has steam power, concentrator, and a smelter with reverberatory furnaces, turning out blister copper. At close of 1905 a new vein, 14' wide, with a 33" paystreak averaging 12% copper, was cut on the 530' level, and is to be developed. Production, 1905, is estimated at 1,000,000 lbs. fine copper.

CROWN LYELL, LTD.

TASMANIA.

Dissolved, December, 1902. Described in Vol. V.

CROWN LYELL MINE.

TASMANIA.

Mine office: Mt. Lyell, Montague Co., Tasmania. George Young, manager. Has a 719' tunnel and 514' shaft, latter showing some ore of medium grade. Suspended operations in latter part of 1905.

CROWN POINT MINING CO.

WASHINGTON.

Office: care of Pioneer Investment & Trust Co., 709 Grant Bldg., Los Angeles, Cal. Lands, sundry claims in Chelan county, Washington, said to show ores of silver, copper and molybdenum. Presumably idle.

MINA LA CRUZ.

MEXICO.

Office and mine: care of Ernesto Avila, owner Indé, Durango, Mexico. Was completing a 40-ton matting furnace, at close of 1905.

COMPAÑIA MINERA DE LA CRUZ.

MEXICO.

Letter returned unclaimed from former mine office, La Cruz, Tamaulipas, Mexico.

CRYSTAL LAKE GOLD & COPPER

COLORADO.

MINING & SMELTING CO.

Office: 915 Barristers' Hall, Pemberton Sq., Boston, Mass. Philip G. Dawson, president; Kendric P. Crawford, treasurer and general manager; A. D. Wise, secretary. Capitalization \$1,500,000, shares \$1 par. Lands, 10 claims, 4 on Hotchkiss Mountain, south of Lake City, Hinsdale county, Colorado, and others in vicinity, showing ores of gold, silver, copper and lead.

CRYSTAL MINING CO.

WASHINGTON.

Office: 45 Jamison Blk., Spokane, Wash. Letter returned unclaimed from former mine office, Bolster, Okanogan Co., Wash. Ores carry gold silver, lead and copper. Had steam power and a small smelter.

CRYSTAL MOUNTAIN MINING & DRAINAGE CO.

COLORADO.

Mine office: Crystal, Gunnison Co., Colo. Geo. W. Melton, superintendent, at last accounts. Ores carry copper, gold and silver. Mine is opened by tunnel, and has steam power.

CUAHTEMOC MINING CO.

MEXICO.

Office: care of J. Albert McKay, secretary, 508 Germania Bank Bldg., Pittsburg, Pa. Mine office: Ocotlán, Oaxaca, Mex. James McKay, president; Frank A. Vickery, treasurer; Guillermo W. Thompson, manager. Organized, 1904, under laws of West Virginia, with capitalization \$400,000, Lands, 21 pertenencias, showing ore bodies carrying gold, silver, lead and copper. Presumably idle.

CUARTAS MINING CO.

MEXICO.

Office: care of Harry McIntosh, Chicago, Ills. Mine office: Ayutla, Jalisco, Mexico. Harry McIntosh, president; Wm. H. Lees, vice-president

and general manager; Wm. T. Sheffield, secretary and treasurer. Capitalization, \$100,000. Property is the old Cuartas mine, in the Bautista district, with sundry timber lands adjoining.

CUBA MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Development is by tunnel, showing auriferous copper ores.

CUBAN EXPLORATION CO.**CUBA.**

Office: 11 Nassau St., New York. Letter returned unclaimed from former mine office, El Caney, Santiago, Cuba. W. A. Dennis, vice-president and general manager. At last accounts was reopening old and developing new copper properties, in the vicinity of Santiago de Cuba.

CUBAN LAND & DEVELOPMENT CO., LTD.**CUBA.**

Office: Dashwood House, London, E. C., Eng. Cuban office: Bahia Honda, Pinar del Rio, Cuba. W. R. Beit, agent. Organized Oct. 26, 1905, as successor to Cuban Mining & Development Co. Property is the Finca Nazareno, a plantation on which present company is centering its operations. Lands also include 2,766 acres of mineral territory in vicinity of Bahia Honda, and two gold claims in the province of Santa Clara. The copper mines have 5 old shafts, with workings of considerable extent, but in very bad condition. Company does not contemplate any mining operations in the near future.

CUBAN MINING & DEVELOPMENT CO., LTD.**CUBA.**

Reorganized as Cuban Land & Development Co., Ltd.

CUBANA CONSOLIDATED COPPER CO.**MEXICO.**

Office: care of R. M. Fitzgerald, 16-309 Montgomery St., San Francisco, Cal. Mine office: Arizpe, Sonora, Mex. Don Ray, president; A. H. Rose, vice-president; M. A. Nurse, secretary; Geo. H. McLean, superintendent. Organized January 6, 1903, under laws of Arizona, with capitalization \$500,000, shares \$1 par. Lands, 244 pertenencias, area 602 acres, bought for \$20,000, showing 6 ore bodies, of 4' to 20' width, of which 3, carrying estimated average values of 12% copper, 10 oz. silver and \$2 gold per ton, are opened by 6 shafts, deepest 102', and by a number of tunnels, longest 250' and 575', with a total of 1,415' of underground openings. Uses horse power. Mine is about 40 miles from La Cananea, the nearest railroad point, and is connected therewith by a good wagon road. Sample carloads of ore smelted gave returns of 23% copper, with fair gold and silver values. Property is considered of considerable promise.

CUCHARAS MINING CO.**MEXICO.**

Mine office: Acaponeta, Tepic, Mexico. J. M. Winston, manager. Operates the San Juan copper mine, opened by shaft and tunnel. Has steam power and a 40-ton smelter, employing about 50 men. Production, 1903, was 200,618 lbs. fine copper.

MINAS LA CUEVA y PEDRO ESTABAN.**MEXICO.**

Mine office: Mazapil, Zacatecas, Mexico. Owned by estate of J. S. Morrison. Manuel R. Orozco, manager. Produce copper as a by-product from silver-gold ores. Have steam power and a 25-ton smelter, employing about 100 men, at last accounts.

LA CUIVRE GROUP.**BRITISH COLUMBIA**

Office: care of E. A. Cleveland, owner, Vancouver, B. C. Located on Princess Royal Island, Skeena River Division, Cassiar District, B. C. Development is limited to tunneling. Idle.

MINA CULEBRA.**MEXICO.**

Mine office: Etzatlán, Jalisco, Mex. T. C. & H. K. Myers, owners. Is an antigua, developed by several hundred feet of shafts and tunnels, showing auriferous and argentiferous copper sulphides, in a vein of 1 to 3 metres width.

CULLIGAN MINE**WISCONSIN.**

A property in Douglas county, Wisconsin, which produced a little high-grade copper rock, (said to have come from a Michigan mine) in 1899. Idle.

CULLOWHEE COPPER CO.**NORTH CAROLINA.**

Reorganized, 1905, as Cullowhee Mining & Reduction Co.

CULLOWHEE MINING & REDUCTION CO.**NORTH CAROLINA.**

Office and mine: Cullowhee, Jackson Co., N. C. S. B. Ezell, president; D. D. Davies, vice-president; Thos. C. Cox, secretary. Organized 1905, as successor to Cullowhee Copper Co. Lands, 1,300 acres, including the old Cullowhee mine. Equipment includes steam and water power plants, hoists, Sullivan air-compressor and power drills. It is planned to install an electric plant to be run by water power. The mine shows a large body of high-grade sulphide ore, and is being developed on a large scale, with highly promising results. In fact the Cullowhee gives promise of making the first successful copper mine in North Carolina.

CUMARAL MINES & DEVELOPMENT CO.**ARIZONA.**

Letter returned unclaimed from former office, Oakland, Cal. Mine office: Old Glory, Pima Co., Ariz. Had auriferous and argentiferous copper ores, with gasoline power.

CUMBERLAND COPPER CO., LTD.**NEVADA.**

Office: 1033-141 Milk St., Boston, Mass. Capitalization \$6,000,000. Company presumably is organized under laws of Maine. Is supposed to have property in White Pine county, Nevada, and very possibly is some relation of the Cumberland-Ely Copper Co.

CUMBERLAND-ELY COPPER CO.**NEVADA.**

Office: 71 Broadway, New York. Mine office: Ely, White Pine Co., Nev. Geo. Gunn, general manager. The private secretary of Daniel Guggenheim, of the American Smelting & Refining Company is president, and Messrs. Jas. Phillips, Jr., Barton Sewall and others are interested. Property presumably is controlled by the American Smelters Securities Co., which is supposed to own 51% of the stock. Capitalization \$5,000,000, shares \$1 par. Lands are sundry claims of large area, practically surrounding the holdings of the Nevada Consolidated Copper Co., and carrying a continuance of the immense ore body of that company. The mineralized zone is about one-half mile in width and of great length. Four 2-compartment shafts are being sunk on the Jupiter group, and very extensive developments are planned. The ore, while low in grade, is of vast extent, ore in sight having been estimated

as high as 25,000,000 tons. Management of the company is good, and the property is of great prospective value.

CUMBERLAND GROUP.**WYOMING.**

Mine office: Saratoga, Carbon, Co., Wyo. Lands are sundry claims on the southern slope of Coad Mountain, showing a 12' ledge of quartzose material, conforming in dip and trend with the schists that form the country rock. A tunnel is being driven to cut this vein, at a depth of circa 1,000'.

CUPRITE COPPER CO.**ARIZONA.**

Dead. Succeeded by Golden Rule Copper Mining & Smelting Co., also dead, under scandalous circumstances.

CUPRITE COPPER CO.**ARIZONA.**

Office: Columbus, Ohio. Mine office: Clifton, Graham Co., Ariz. Employs 15 men. N. W. Lord, president; Isaac N. Stevens, vice-president; L. B. Kauffman, secretary; Geo. B. Kauffman, treasurer; F. C. Alsdorf, superintendent; Frank A. Ray, engineer; preceding officers and Frank B. Laine, directors. Organized March, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 26 claims, area 490 acres, in the Copper Mountain district, opened by shafts of 30' and 320' and by tunnels of 150' and 260', showing ore bodies of 5' to 100' width. The work performed has been done in the leached zone, which carries isolated pockets of rich ore, from which sundry small shipments have given returns of 15% to 30% copper, and up to \$5 gold per ton. Claims apparently are well located, and have a large ore body in the leached zone. Smelter shipments of 33 tons, 1905, gave average returns of 15% copper. Management plans sinking main shaft to the sulphide zone, and driving a tunnel to cut all the veins of the property, at depths of 1,000' or more, as soon as the grade and character of the sulphide ores are proven by the main shaft. Company also owns about 2,000 linear feet of strong hematitic outcrops, ranging from 5' to 100' in width. It is likely that the copper veins, which are parallel with and similar to the Big Coronado vein of the Arizona Copper Co., are leached to very considerable depths, but prospects for developing large and profitable bodies of low and medium grade sulphides at depth are excellent. Company is well regarded, both as to management and lands.

CUPRITE MINING CO.**WYOMING.**

Mine office: Holmes, Albany Co., Wyo. Presumably idle.

CURLEW MINE.**MONTANA.**

Office: care of A. M. Holter, owner, Butte, Mont. Mine office: Victor, Ravalli Co., Mont. Thos. Cowan, superintendent. Mine was formerly a silver producer, and also shows zinc ores. A 12' vein carrying 10% copper, also values in gold, silver and lead, was opened early in 1906.

CURTIN DAVIS PROPRIETARY CO.**TASMANIA.**

Offices: 39, Queen St., Melbourne, Australia, and Palmerston House, London, E. C., Eng. Mine office: Dundas, Tasmania. W. Knox, chairman; R. E. Tweddell, manager; E. Habben, secretary. Organized June 24, 1896, under No Liability act of Victoria, with capitalization £200,000, shares £1 par; issued, £182,229. Lands, 180 acres of argentiferous copper lands, with a developed mine, leased on tribute.

CUSHING y WALKUP.**MEXICO.**

Mine office: La Trinidad, Otaez, Durango, Mex. Emil Bruckhold, superintendent. Operate the Quien Sabe, Promontorio and other mines, employing about 200 men. Development is by tunnels. Mines have steam power and a 50-ton smelter with a single matting furnace. Production of copper is small, as copper is used merely as a carrier in making an iron-copper matte averaging 15% copper, 300 to 400 oz. silver and 12 oz. to 15 oz. gold per ton.

CYPRESS MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Bigbug, Ariz.

DACOTA MINING CO.**MICHIGAN.**

Wound up, 1905, and lands sold for building lots.

DAIRA MINE.**JAPAN.**

Mine office: Fujikoto-mura, Yamamoto-gori, Ugo, Japan. Mine was opened, 1862, on numerous veins without fixed strike or dip, and frequently crossing, in andesite country rock. Ores are galena, chalcopryite, sphalerite and iron pyrites. Product is chiefly silver and lead, with a very small amount of copper as a by-product.

DAKOTA CALUMET COMPANY.**SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Sheridan, Pennington Co., S. D. Samuel A. Baker, vice-president; Wm. J. Booth, secretary; H. C. Ellison, treasurer. Organized 1902, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par. Is controlled, through stock ownership, by the Continental Copper Co. Lands, 19 patented claims, including the Lilian group, area 179 acres, also a 27-acre millsite, with total landed holdings of 319 acres. Has shafts of 40', 80' and 100' and a tunnel of 380', giving total underground openings of 600', on the strength of which a 150-ton smelter was built. Has a 40-h. p. hoist, good for depth of 1,000', a 10-drill Sullivan air-compressor and 5 power drills. Buildings include a carpenter shop, smithy, laboratory and three dwellings. The smelter, $\frac{1}{4}$ mile from the mine, and several hundred feet lower, of wood on stone foundations, is connected with the mine by a Bleichert aerial tram and has a 150-ton Colorado Iron Works blast-furnace, with 120-h. p. steam plant, and was planned to turn out pimple copper of 80% tenor. Idle for several years, and company apparently exhausted financially.

DALANE SOELV-OG-KOBBERGRUBER.**NORWAY.**

Mine office: Brunkeberg Sogn, Norway. Is a small producer of silver and copper, when operated, which is irregularly.

DALKEY MINE.**AUSTRALIA.**

Office: Port Adelaide, South Australia. J. Johnson, manager.

DALTON & LARK MINING & MILLING CO.**UTAH.**

Controlled by Bingham Consolidated Mining & Smelting Co.

DALY COPPER MINING CO.**AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. Sutherland, manager. Has steam power, and employed about 20 men, at last accounts.

DALY JUDGE MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. John Daly, president; O. J. Salisbury, general manager; John McSorley, superin-

tendent. Organized 1901, under laws of Utah. Has authorized a bond issue of \$300,000, at 7%. Lands, 146 claims, area 715 acres, including the Anchor mine, with three ore bodies, known as the South, Contact and North veins, the middle or contact vein being the principal and showing a well defined and persistent outcrop, traced 3,000'. Property also includes the Bonanza group, regarded as valuable but lacking development. Ore values are mainly in silver and lead, with a little copper as a by-product. The 6,000' Anchor tunnel, for operating and drainage purposes, is connected with the 1,200' level of the 1,650' three-compartment Anchor shaft, which has a powerful hoist operating double-deck cages. The Anchor workings are said to have about 200,000 tons of ore blocked out for stoping. The mine has about 8 miles of underground openings, and makes 300 to 450 gallons of water per minute, this being sufficient for the use of the concentrator, and water is supplied, under contract, to the Daly West. There also is a lake, two miles from the mine, affording an alternative water supply. The concentrator has a capacity of about 300 tons daily, and the Sherman slimes process has proven highly satisfactory, reducing the crude ore about 6 into 1, concentrates having a net value of approximately \$35 per ton. Property is considered good, and management stands well locally, but is entirely too secretive about the work done and results secured.

DALY MINING CO.**MONTANA.**

Office: care of Marcus Daly Estate, Butte, Mont. Letter returned unclaimed from former mine office, Copperopolis, Meagher Co., Mont. Organized 1903, under laws of Arizona, with capitalization \$1,000,000, to take over sundry mining properties of the Marcus Daly estate, in Meagher, Silver Bow and Lewis & Clark counties, Montana. Properties in Meagher county are the Copperopolis, Daly, North Pacific, Darling Fraction and others. The Copperopolis mines have 3 shafts, deepest 500', with a good surface equipment, and were small producers of high-grade ore for many years, but have been idle since 1903.

DALY WEST MINING CO.**UTAH.**

Office: 163 South Main St., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Employs about 500 men. J. Ernest Bamberger, president; W. Dixon, vice-president; W. S. McCornick, treasurer; preceding officers, F. J. Hagenbarth and Lazard Kahn, directors; J. Barnett, secretary; Ernest Bamberger, general manager; J. A. McCaskell, general superintendent; F. W. Sherman, mill superintendent; Corporation Trust Co., of New York, First National Bank of Boston and McCornick & Co. of Salt Lake City, registrars; McCornick & Co., of Salt Lake City, American Loan & Trust Co., of Boston, and North American Trust Co., of New York, transfer agents. Organized Feb. 14, 1902, under laws of Colorado, with capitalization \$3,600,000, shares \$20 par. Paid dividends of \$1,332,000 in 1903; \$1,044,000 in 1904, and \$432,000 in 1905, with total dividend disbursements, to end of 1905, of \$5,067,000. Ended 1905 with a cash balance of \$411,886.15.

Lands, 50 patented claims, area 250 acres, in the Uintah district, showing extensive ore bodies carrying argentiferous and auriferous chalcopryrite, galena and sphalerite, with a silicious gangue. Ore production is about equally divided between smelting and concentrating grades. The mine has three

principal veins, of 4' to 6' minimum width and up to 40' maximum width. Mine has an extreme depth of 1,700' and has upwards of 10 miles of workings. Much exploratory and development work was done during 1905, with encouraging results, and new ore bodies are being developed. The Ontario drain tunnel No. 2 is being extended into the Daly West property, at the expense of the Daly West company, which pays therefor a monthly rental of \$750. This tunnel will unwater the lower levels, about 600' below the present openings.

The concentrator, of 350 tons daily capacity, is equipped with crushers, rolls, two 5' Huntington mills, Wilfley tables, and an automatic ore-sorting belt. The practice of this concentrator, under the management of Mr. Sherman, is exceptionally advanced, and results secured on complex ores are not exceeded in any American reduction plant, the saving being 98% in lead and 70.5% in silver, with six tons put into one. The tailings mill, 56x82' in size, stands about 400' northeast of the concentrator, and has a 5' Huntington mill for regrinding, 7 slime, settling and classifying tanks, 2 two-compartment jigs, 6 concentrating tables and 1 Wilfley table. This mill was planned to treat the enormous tailings dump of the property, at a cost of 15 cents to 20 cents per ton, with a net profit of 25 cents to 50 cents per ton, at the rate of 200 to 250 tons daily. An ample water supply for both mills is secured, under contract, from the Daly Judge mine.

Production has shown a considerable decrease during each of the two past years, and receipts were only \$1,237,139.60 in 1905. The large reserves of high-grade ore were much impaired, by undue crowding for several years, and hopes for the future must be placed mainly on the large bodies of low-grade milling ore, and on the development of new high-grade ore bodies. The mine has about three years' supply of concentrating ore blocked out, with further large quantities available for future development. Production, 1905, was 1,225,731 lbs. fine copper, 16,712,978 lbs. lead, 9,026,517 lbs. zinc, 1,798,628 oz. silver and 1,397 oz. gold. Confidence in the mine and its management has been impaired by the mistaken policy, followed for several years, of pushing the mine nearly to the point of exhaustion. For the past two years the mine has been managed along sounder lines, and with a keener eye to the future welfare of the property. Developments are of a favorable nature, and the future of the property seems brighter than since 1903.

DAMARALAND COPPER

GERMAN SOUTHWEST AFRICA.

SYNDICATE, LTD.

Voluntarily liquidated, February, 1903.

DANA COPPER CO.

MICHIGAN.

Office: 68 Devonshire St., Boston, Mass. F. H. Raymond, president; C. O. Burbank, secretary and treasurer; preceding officers, John C. Watson and J. H. Chandler, directors. Lands, 640 acres, being the East $\frac{1}{2}$ of Section 24 and East $\frac{1}{2}$ of Section 25, in Town 58 North, Range 31 West. Property is bounded on the north by the Arnold, and on the other three sides by the Central. Was never a producer, and idle for many years.

DANES LEA MINING CO.

CALIFORNIA.

Office: care of W. C. Harland, president, San Diego, Cal. Mine office:

Encinitas, San Diego Co., Cal. W. H. McKinnon, manager. Lands, 20 claims, 8 miles east of Encinitas, with shafts of 100' and 280', also a tunnel. Has a 3' vein of medium-grade chalcopryite, traversing porphyry. Has gasoline power. Presumably idle.

DANVILLE & VIRGINIA COPPER MINING CO.**VIRGINIA.**

Merged, 1903, in Carolina King Mining Co.

DARGIN & RICHARDSON.**MEXICO.**

Office and mine: Unión de Tula, Jalisco, Mex. Lands, 60 pertenencias, 7 miles southwest of Ayutla, showing a fissure vein of 5' to 10' width, in diorite, carrying argentiferous oxides and carbonates, associated with hematite. Has a 130' shaft and 325' tunnel, with some ore blocked out for stoping.

DARNELL MINING & MILLING CO.**WASHINGTON.**

Mine office: Kalama, Cowlitz Co., Wash. H. M. Stevens, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power, concentrator and 50-ton cyanide plant.

DARTMOOR MINERALS, LTD.**ENGLAND.**

Offices: 28, Victoria St., London, S. W., Eng. R. F. Eden, secretary. Organized July 21, 1905, with capitalization £15,000, shares £1 par, in 8,000 ordinary £1 shares and 40,000 deferred 1s. shares.

DAULTON COPPER CO.**CALIFORNIA.**

Letter returned unclaimed from former mine office, Daulton, Cal.

DAVENPORT MINE.**WASHINGTON.**

A prospect, near the head of Horseshoe Basin, Washington. A ton of ore shipped to smelter gave returns of \$69, in lead, copper, silver and gold.

DAVID HARUM COPPER CO.**TEXAS.**

Office: 30 Broad St., New York. Moribund.

ERZBERGWERK DAVID VEREINIGUNG.**GERMANY.**

Office: Köln, Westfalen, Germany. Carl Hobert, Jr., president. Has lead-copper ores, opened by one pit and one shaft.

DAVIS MINING & SMELTING CO.**CALIFORNIA.**

Out of business and presumably dead.

DAWES RANGE COPPER & GOLD MINING CO.**AUSTRALIA.**

OF QUEENSLAND. (NO LIABILITY.)

Offices: 78, Queen St., Melbourne, Australia, and 76, Bishopsgate St., E. C., Eng. Hon. Henry Foster, J. P., chairman; John Brown, manager; Stobbs & Roscoe, British agents. Organized January, 1900, under laws of Victoria, with capitalization £300,000, shares £1 par; issued, £250,000. Lands, 240 acres, in the Gladstone district of Queensland. Idle, owing to lack of funds.

DAY DREAM & BRETONARTE COPPER MINING CO.**AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. M. Montague, manager. Has steam power and employed about 50 men, at last accounts.

DEADWOOD GOLD & COPPER MINES CO.**SOUTH DAKOTA.**

Letter returned unclaimed from former mine office, Deadwood, S. D.

JULIA DEANE MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. David Clay, manager. Has a tunnel showing gold-copper ores. Has steam power. Idle.

DECATUR COPPER MINING CO.**ARIZONA.**

Office: 503 North Main St., Decatur, Ills. Mine office: Jerome, Yavapai Co., Ariz. W. J. Wayne, president; Frank P. Wells, vice-president and treasurer; Geo. R. Bacon, secretary; W. S. Owens, superintendent. Organized 1897, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 10 claims, area 180 acres, also a 10-acre millsite, 10-acre smelter-site and sundry other lands, in the Verde district, showing 10 fissure veins and lenses, of which 4 are being developed, these having an average width of 4' and giving average assays of 5% to 8% copper, 20 oz. silver and \$10 gold per ton. Has oxide and carbonate ores near surface, with sulphides below 60' depth, opened by 6 shafts, deepest, 280', and by tunnels of 70' and 150'. Also has a free-milling gold vein, in the Mineral Point district. Has gasoline power. Officers are men of good standing and property is considered promising, but company is suffering from the common trouble of lack of funds, and operations are on a very restricted scale.

DEDHAM COPPER MINING CO.**WISCONSIN.**

Office: West Superior, Wis. Abram G. Ross, president; Wm. C. Burke, secretary. Organized November, 1902, under laws of Wisconsin, with capitalization \$1,300,000, shares \$25 par; debentures, \$150,000 authorized at 6%. Lands, 320 acres, also a 12-acre millsite, with waterfall estimated at 2,400 h. p. available. Has steam power and air-compressor. Property was tested by 34 pits, and a shallow shaft, showing 3 cupriferous amygdaloid beds, each claimed to average 90' width and to be about one-third mineralized. Idle.

DEEMS MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. C. D. Rooklidge, president; Abram Hanauer, Jr., secretary and treasurer. Organized 1904, with capitalization \$75,000, shares 25 cents par.

DEEP RIVER GOLD MINING CO.**NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. W. G. Gaither, manager. Property is an old and idle mine, carrying gold-silver-copper ores.

DEER CREEK DEVELOPMENT CO.**UTAH.**

Mine office: American Fork, Utah Co., Utah. John Cleghorn, president; Henry Johnson, secretary. Organized 1903, with capitalization \$125,000, shares 25c. par. Land, 7 claims, in the Deer Creek division of the American Fork mining district, showing a 3' to 6' fissure vein in granite, ore therefrom giving assays of 22% copper and 7 oz. silver per ton.

DEER CREEK GOLD & COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Had a tunnel, showing considerable low-grade ore.

SOCIEDAD MINERA DEFENSO y TODOS SANTOS.**CHILE.**

Mine office: Taltal, Antofagasta, Chile. Daniel Olivia, superintendent. Has auriferous copper ores and employed about 40 men, at last accounts.

DE LAMAR-WALL MINING & MILLING CO.

Dead. Lands sold, 1903, to Utah Copper Co.

DE LAMAR'S COPPER REFINING CO.**NEW JERSEY.**

Office and works: Chrome, Middlesex Co., N. J. E. G. Hothorn, president; L. Vogelstein, vice-president; A. F. Holden, managing director; F. W. Batchelder, treasurer; F. O. Dettman secretary; H. A. Prosser, general manager. Organized 1903, under laws of New Jersey, with capitalization \$3,100,000. Is owned jointly by the United States Mining, Smelting, Refining & Mining Co. and the metal brokerage house of Aron Hirsch & Sohn, Halberstadt, Germany.

The company has a plant at Chrome, N. J., for copper, and a lead plant at Grasselli, Ind. The Chrome works comprise an electrolytic copper refinery, with monthly capacity of 6,000 tons, and a complete smelting and converting plant for the treatment of ores, concentrates, mattes and bullion, was being erected in the spring of 1906. Copper supplies are received mainly from Utah, Montana, Arizona, California and British Columbia, with odd lots picked up from other fields. The copper is received in slabs or cakes, and is cast into anode plates of 350 lbs. to 400 lbs. weight, by a Walker casting machine with 22 molds. The plant has two 75-ton reverberatory furnaces, for remelting blister copper, and two furnaces for remelting cathode copper. The plant includes a circular blast-furnace, 42" at the tuyeres and 13' high, using blast under pressure of 11 oz. per square inch.

Anodes are transferred in sets of 15 from the casting machine to the electrolytic tanks, by electric traveling cranes. The electrolytic plant has 816 cells, forming two systems of 12 compartments, with 34 baths each, 408 cells in a system. Tanks are lead-lined, 3' 6" broad, 3' deep and 10' long, each bath containing 15 anodes and 16 cathodes, the extra cathode providing terminal plates. Cells are arranged in steps, in two rows, with a 12" drop between tanks. Current is conveyed to the cells by copper leads of $1\frac{1}{2} \times 4\frac{3}{4}$ ". Current density is 15 to 17 amperes per square foot, and the difference of potential of bath is 0.3 volts. The cell bath temperature is 52° to 57° C. Bath contains 40 grams of copper and 140 cc. sulphuric acid per liter. The blister copper treated contains antimony, arsenic, selenium and tellurium, as well as copper, nickel, gold and silver, and the sludge from the tanks is treated by filter presses and refined in a cupel furnace for gold and silver values. As much silver is volatilized in refining, the gases from the furnace are sucked off by a fan, then cooled and filtered through flannel sacks, before entering the stacks. From the waste electrolyte liquor, crude nickel sulphate and copper sulphate are made, there being, in connection with the refinery, a sulphate plant where bluestone is produced for the requirements of the works. Waste gases from the reverberatory furnace are burned under a Babcock-Wilcox boiler. The power plant includes steam-driven dynamos of 1,000-h. p. and 1,200-h. p., giving 5,500 amperes at 115 volts, and 6,500 amperes at 130 volts, respectively.

The lead plant, located at Grasselli, Indiana, a suburb of Chicago, has a monthly capacity of 2,000 tons, and is the first electrolytic lead refinery in the United States. The plant and metallurgical processes of the De Lamar works are strictly modern, and the practice is excellent.

DELAWARE MINE.

A property in Keweenaw county, Michigan, on which sums aggregating about \$3,300,000 were sunk by successive managements. Now owned by Calumet & Hecla Mining Co., and described under title of Manitou. Old operations very fully described in Vol. II.

DEL COBRE CONSOLIDATED MINING CO.

Mine office: Florence, Pinal Co., Ariz. Organized under laws of Delaware. Lands, 15 claims, 12 miles east of Florence, held under bond and lease, opened by a 200' shaft, showing ores carrying gold, silver and copper.

MINA DELFINA.

Office: Centro Mercantil No. 3, Mexico, D. F. Mine office: Chilpancingo, Guerrero, Mexico. Paul Merienne, mine manager. Ores carry silver, gold and copper values. Has steam power and a 5-stamp mill.

DEL MONTE MINES.

Office: care of M. F. Donovan, owner, Tucson, Ariz. Lands, 7 claims, 35 miles from Tucson, on the southeastern slope of the Santa Catalina Mountains, with about 700' of shafts and tunnels, developing a vein of 80' to 100' width, from which it is claimed that 10,000 tons of ore, carrying 15% copper and \$4 gold per ton, have been placed on the dump. Operations are hampered by lack of rail facilities, which are hoped to be secured by the construction of the Phoenix & Eastern railway.

DEL NORTE COPPER CO.

Office: care of Ellery R. Bassett, New Bedford, Mass. Lost lands, near Kirtland, Yavapai county, Arizona.

DEL NORTE COPPER CO.

Letter returned unclaimed from former mine office, Smith River, Del Norte Co., California.

DEL ROY COPPER MINING & SMELTING CO.

Office: El Paso, Texas. Mine office: Alamogordo, Socorro Co., N. M. Employs 25 men. Wm. Moeller, president; W. J. Harris, vice-president; H. F. Kettler, secretary and treasurer; M. D. Gaylord, general manager; Geor Munroe, mine superintendent. Organized April 6, 1906, under laws of New Mexico, with capitalization \$2,500,000, shares \$2.50 par. Lands, 57 claims, area 1,157 acres, also a 60-acre millsite, 300 acres timber lands and 160 acres placer claims, in the San Andreas district, showing 23 fissure and contact veins, in a formation of granite-porphry and schist, overlaid by a lime capping. Work has been done on 11 veins, ranging 3' to 150' in width, mine having 1,975' of underground openings, estimated to show 50,000 tons of ore, with 32,000 tons blocked out for stoping, averaging 8% copper, 5 oz. silver and \$1 to \$5 gold per ton. Properties include several extensive antiguas. Company hopes to secure railroad transportation by a narrow-gauge line, reaching within 6 miles of the mines, and plans developing extensively and installing a power plant, 100-ton concentrator and small matting furnace.

DEMOCRATA CANANEA SONORA COPPER CO.

Office: 1006 Commercial Tribune Bldg., Cincinnati, Ohio. Mine office: La Cananea, Sonora, Mex. Employs 40 men. H. H. Hoffman, president;

MICHIGAN.**ARIZONA.****MEXICO.****ARIZONA.****ARIZONA.****CALIFORNIA.****NEW MEXICO.****MEXICO.**

C. E. Hoffman, vice-president; Wm. H. Simpson, treasurer; Leo. G. Cloud, secretary; Peter F. Hook, superintendent. Organized 1905, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. issued, \$2,000,000.

Lands, 18 pertenencias, lying in the heart of the Greene Consolidated property, between the Cobre Grande and Veta Grande mines of the latter. Development is by a 450' shaft and 500' tunnel, with about two miles of underground openings, estimated to place in sight 350,000 tons of ore carrying 6% copper and about \$3 gold and silver per ton. Has a 125-ton concentrator and 125-ton smelter, and plans building a new 300-ton smelter with modern equipment. Production, 1903, was 3,747,820 lbs. fine copper, since which year production has been suspended, but is to be resumed shortly.

DEMOCRATA MINING CO.

MEXICO.

Succeeded, 1905, by Democrata Cananea Sonora Copper Co.

DENN-ARIZONA DEVELOPMENT CO.

ARIZONA.

Office: 600 First National Bank Bldg., Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Employs 50 men. Martin Pattison, president; Thos. Bardon, vice-president; L. C. Shattuck, treasurer; Byron M. Pattison, superintendent; preceding officers, Archibald Mark Chisholm, A. Guthrie and Maurice Denn, directors; John G. Williams, secretary; Jos. Collie, mine superintendent. Organized 1905, under laws of Arizona, with capitalization \$750,000, shares \$10 par.

Lands, 13' claims, area circa 200 acres, partly owned in fee, and partly held under bond and lease, lying immediately north of the Junction. Three claims, under option from John M. Johnson, have been surrendered. Main shaft, 980'. The conglomerate capping was penetrated and limestone reached at 810', and it is planned to begin drifting and crosscutting in four directions, at a depth of 1,000'. It is expected that the shaft will prove wet and a pump station, to be cut on the 1,000' level, will have two triple-expansion pumps, each of 1,000 gallons capacity per minute, working against a 1,000' head. There also will be three 800-gallon sinking pumps. The main shaft has a first-motion Ottumwa Corliss hoist, raising double-deck cages, and an air-compressor. A second shaft was started May 8, 1906, on the Lee claim. This has a temporary hoist and 6-drill Sullivan air-compressor. Mine has 6 buildings. Considerable diamond drilling has been done, and ores averaging 12% copper were secured from a 30' core of disseminated cuprite, found at a depth of 950'. Management is experienced and capable, and property is one of much promise.

DENORO MINES, LTD.

BRITISH COLUMBIA.

Office: Rossland, B. C. Mine office: Eholt, Yale district, B. C. Ross Thompson, president; Dr. J. A. L. McAlpine, vice-president; Smith Curtis, secretary, treasurer, and managing director; S. L. Graham, mine superintendent. Organized 1903, under laws of British Columbia, as successor of the King Mining Co., Ltd., with capitalization \$1,500,000, shares \$1 par. Lands, 4 claims, area circa 190 acres, adjoining the British Columbia mine, in the Boundary district. Property shows 3 ore bodies, of 20' to 100' width, carrying auriferous and argentiferous chalcopryite, with iron pyrites and

lime gangue. Owing to the excess of iron and lime, the smelters pay a premium for fluxing use, actual smelting cost, 1903, being only 16 cents per ton, to the Denoro company. Mine has a 190' shaft, but principal development is by 3 tunnels. Production, 1904, was 529,930 pounds fine copper, 4,657 oz. silver and 684 oz. gold. Ore production, in February, 1906, was at the rate of 100 tons daily, and it was then planned to increase shipments to 200 tons daily, in a short time. Property is considered decidedly promising. Was bought, June, 1906, by British Columbia Copper Co., Ltd.
DENVER COPPER MINING & LEASING CO. **COLORADO.**

Mine office: Morrison, Jefferson Co., Colo. Everett B. Curtis, secretary and treasurer. Idle for some years.

DENVER GROUP GOLD & COPPER CO.

ARIZONA.

Office: 319 Douglass Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Ariz. Thos. S. Wadsworth, president. Capitalization \$2,000,000, shares \$1 par. Lands, 10 patented claims, area 194 acres, 12 miles northeast of Wickenburg. Mineral formation traced 6,000', with 80 to 300' width of vein matter, showing scattered parallel veins and stringers. Has tunnels of 225' and 600', also 5 prospecting shafts. Ore is sulphide, carrying a little native copper, assaying up to 15% copper and \$10 gold per ton. Property considered promising, but idle for several years.

DENVER MINE

ARIZONA.

Mine office: Gilbert, Yavapai Co., Ariz. John Witherally, owner. Has gold-copper ores. Idle at last accounts.

DERBY SYNDICATE, LTD.

AUSTRALIA.

Voluntarily liquidated, July, 1902.

DEROFFSKI MINE.

SIBERIA.

A small copper producer, near Semipalatinsk, Siberia.

COMPAÑIA MINERA Y FUNDIDORA DESCUBRIDORA.

MEXICO.

Mexican title of Descubridora Mining & Smelting Co.

DESCUBRIDORA MINING & SMELTING CO.

MEXICO.

Office: 17 Battery Place, New York. Mine offices: Mapimí, Durango, Mexico, and Conejos, Sinaloa, Mexico. R. Brendel, general manager. Principal property is the Descubridora group, at Mapimí, opened by a 500' shaft, showing very large quantities of very low-grade basic silver-copper carbonate ore, requiring silicious ores for fluxing, latter bought in the market, as not produced by the company's mines. The Mapimí property has a complete steam and electric power equipment, and had a 600-ton smelter, built 1902, but a portion of this smelter has been sold to the Continental Copper Co. Property was leased by the Guggenheim Exploration Co., which was succeeded by the American Smelters Securities Co. Mapimí property idle since 1903. Property at Conejos includes several mines and a 200-ton smelter, idle since 1901. Production, 1903, was 4,964,272 lbs. fine copper.

DESERT QUEEN MINE.

ARIZONA.

Mine office: Quartzite, Yuma Co., Ariz. Lands, 11 claims, in 2 groups, opened by crosscut tunnels, cutting veins at 300' to 500' depth, with 600' of drifting on the ore bodies. Has a 40-h. p. gasoline engine, air-compressor

and power drills. Has been under development since circa 1902. Ores have given smelter returns of 10% copper, 25 oz. silver and \$12 gold per ton.
DESPATCH COPPER-GOLD MINING CO. COLORADO.

Office: care of R. A. Gurley, secretary and treasurer, Denver, Colo. Mine office: Morrison, Jefferson Co., Colo. Henry Appel, president; O. M. Deemer, managing director; Geo. Q. Adams, vice-president and superintendent. Lands, 8 patented claims, adjoining the F. M. & D. property, opened by shafts, showing stringers of ore assaying 9% to 14% copper. Has steam power and plans continuing development.

DE SOTO MINING CO.

ARIZONA.

Office: 71 Broadway, New York. Mine office: Middleton, Yavapai Co., Ariz. J. L. Elliot, president; Cyrus Robinson, vice-president; Benj. Prince, secretary; preceding officers; C. E. Finney, Francis Risk, LeRoy T. Harkness, and Albert Kerr, directors; R. T. Mason, superintendent; Pope Yeatman, engineer. Organized January, 1905, under laws of New Jersey, with capitalization \$100,000, shares \$100 par. Bonds, \$1,000,000 authorized, at 6%; issued, \$500,000.

Lands, 82 claims, area 1,400 acres, in the Bradshaw Mountains, about 40 miles southeast of Prescott, covering about 6½ miles of the strike of a very persistent copper formation. Lands, formerly held by Bradshaw Mountain Copper Mining & Smelting Co., lie about midway between Crown King and Mayer. Country rocks are porphyry and quartzite, showing five parallel veins of 10' to 60' width, carrying cuprite, melaconite, chalcocite, bornite, malachite, azurite and chalcopyrite, with schistose gangue, said to average \$12 to \$15 per ton in copper, gold and silver values.

Development is by the 800' Copper Link tunnel and the 2,400' Hot Number tunnel, latter 400' vertically lower than former, cutting the ore body 1,374' below the crest of the mountain, and having a double tram-track, laid with 20-lb. steel rails. Mine has about 8,000' of underground workings, exposing a large amount of ore of medium grade. A 4,000' Bleichert aerial tramway, of 2,000 tons daily capacity, connects the mouth of the Hot Number tunnel with 2,000-ton ore bins at the railway station. Mine plant includes two 80-h. p. boilers, a 24 drill Ingersoll-Sergeant air-compressor, power drills and 9 miles of air and water-pipe lines.

The concentrator, of steel construction, is 160x200', equipped with 2 Blake crushers, 2 centrifugal crushers, 4 sets of rolls, 2 Hancock jigs, 16 Overstrom tables, 16 vanners and 8 sizers. Company has largely the same officers as the Arizona Smelting Co., which owns the new Humboldt smelter, and the mine is operated in close connection with the smelter.

DETROIT COPPER MINING CO. OF ARIZONA.

ARIZONA.

Office: 99 John St., New York. Mine office: Morenci, Graham Co., Ariz. Employs about 1,000 men. James Douglas, president; Cleveland H. Dodge, vice-president; Geo. Notman, secretary and treasurer; Chas. E. Mills, general superintendent; Dr. L. D. Ricketts, consulting engineer; H. H. McLean, mine superintendent; G. E. Hunt, mill superintendent; H. S. Van Gorder, superintendent supply and mercantile department; J. B. Fleming,

mechanical engineer. Organized under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. Mine was opened circa 1880 and has become a very large producer. Lands are extensive, including the Ryerson, Arizona, Central, Copper Mountain, Yankee, West Yankee, Montezuma and Santa Rosa mines, at and near Morenci, opened by tunnels and shafts, deepest workings being about 400' below the surface. Originally mines were worked open-cast, as the ore bodies are of immense size, though low in grade, averaging, 3% to 4% copper, with only traces of gold and silver. Ores are chiefly sulphide, and highly silicious, with gangue carrying up to 40% alumina, requiring very careful handling. Much the larger part of the production is concentrating ore, which is about one-half oxides and carbonates, and one-half sulphides. A 240' ore-bin, at the Ryerson, is connected with the mill by belt conveyor. The Santa Rosa mine, bought circa 1905, is to be developed extensively, and an electric transmission line has been built there-to, and a good mining plant installed.

Gas power is used extensively throughout the mine, mill and smelter, except for hoists and locomotives. A Loomis generator, with capacity to supply gas for developing 1,000 h. p., consumes New Mexico bituminous coal, giving an efficiency of about one horse-power-hour from 1.5 lbs. to 1.75 lbs. coal per hour, effecting a saving of about 30% in fuel costs. The power-house, 64x200', of steel frame on concrete foundations, houses Crossley gas engines of 1,920 h. p. Two 100-h. p. engines drive the blowers, which are connected with the furnaces by a 300' blast-main, a third engine of the same size being kept in reserve as an auxiliary. Two 200-h. p. engines furnish electric power, generated at a voltage of 250, stepped up to 2,500 volts at the power-house and carried by 4 feed wires to a second set of transformers at the West Yankee mine, where it is stepped down to 250 volts, and distributed to the various shafts, tunnels and surface plants. A 500-h. p. engine drives the air-compressor that furnishes blast, at 8 lbs. pressure, to the converters.

The concentrator, at Morenci, has been rebuilt in two sections, each unit having about 500 tons daily capacity. The concentrator has a floor area of 166x240', with Chilean mills, 6 sets of 16x42" rolls, 28 revolving screens, 80 Frue vanners and 40 Wilfley tables, with room for 50 more. Only 400 gallons of water are used in concentrating one ton of ore, about 1,800 gallons of water being in constant use, 125 gallons per minute of clear water being supplemented by clarified water from ingenious and highly effective settling ponds and clarifiers, designed by Mr. Hunt. The mill is designed to concentrate ore as low as 2% in copper tenor, and puts about 7 into 1. Water for the mill is pumped from wells on the San Francisco river, and at the pumping plant Foster superheaters, placed in the setting of the Stirling water-tube boilers, are giving excellent results.

The sampling mill, above the concentrator, takes ore from the latter by a 400' belt conveyor. Both concentrator and sampler are run throughout by electricity, furnished by a plant having four 150-h. p. gas engines. The sampler has a capacity of about 100 tons per hour. Experiments were

conducted, in 1904, with oil concentration, but did not lead to the adoption of the process.

The smelter has four 54x144" blast-furnaces and one 42x264" furnace. Blast is furnished by a 250-h. p. gas engine and an electric motor. A converting plant is being added. About 57% of the ore is smelted as concentrates, and flue-dust is briquetted for resmelting. The smelter has an electric light plant and is thoroughly modern in equipment, with 2,000-ton ore-bins and a steel trestle.

A 36" gauge railway connects the mines and smelter with the Arizona & New Mexico railroad, at Guthrie. This line has a maximum grade of 3.5% and has 4 complete loops within an air-line distance of one and one-half miles, near Morenci. The company operates a mammoth department store and an excellent hotel, and also maintains a library, gymnasium and club-room for employees. Production of refined copper was 16,623,251 lbs. in 1904, and 14,692,421 lbs. in 1905. The property is managed with great skill, and is an exceptionally fine example of a successful low-grade mine.

DETROIT & PARRY SOUND MINING CO., LTD.

ONTARIO.

Office: 311 Wetherbee Bldg., Detroit, Mich. W. A. Phillips, president; H. C. Morris, vice-president; E. A. Covell, secretary; D. M. Pickett, superintendent. Organized June 3, 1903, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par; issued, \$490,750. Lands, in the Parry Sound district of Ontario, have given specimens of ore assaying well in copper.

DEVON UNITED MINES SYNDICATE, LTD.

ENGLAND.

Offices: 6, Pall Mall, London, S. W., Eng. E. B. Haynes, chairman; F. N. B. Hill, secretary; G. W. Ladds, mine manager. Organized June 19, 1901, with capitalization £10,000, shares £1 par; issued, £7,797. Debentures, £5,000 authorized; £4,960 issued, at 6%. Lands, 100 acres, on the river Tavy, Devonshire, England, carrying tin, copper and arsenic ores, including the South mine, a tin property, and the Central mine, latter being considered the most promising copper prospect opened in Cornwall for some years. Has a tin-mill with 28 stamps, but requires additional milling facilities, and probably could use a few thousand pounds cash to advantage.

DEWEY CITY MINING CO.

COLORADO.

Mine office: Gunnison, Gunnison Co., Colo.

DEWEY CONSOLIDATED COPPER & GOLD

IDAHO.

MINING & MILLING CO.

Letter returned unclaimed from former office, Salt Lake City, Utah.

Mine office: Grangeville, Idaho Co., Idaho.

DEWEY MINE.

COLORADO.

Mine office: Saratoga, Carbon Co., Wyo. Capitalization \$400,000, shares \$1 par. Lands, sundry claims, circa 15 miles southeast of Saratoga. Idle.

DEWEY MINE.

UTAH.

Mine office: Ibapah, Tooele Co., Utah. Presumably idle.

DEWEY MINING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Bear, Idaho.

DEWEY & OLYMPIA GROUP.**NEW MEXICO.**

Office and mine: care of U. E. McDaniel, owner and manager, Cooks, Grant Co., New Mexico. Ores carry gold, silver, lead, copper and zinc. Has steam power and a 25-ton concentrator.

DIAMOND JOE MINE.**ARKANSAS.**

Office: care of Frank Pease, Silver City, Montgomery Co., Ark. Lands show ores carrying silver, lead and copper. Idle, at last accounts.

DICKERSON MINING CO.**MONTANA.**

Mine office: care of J. W. Dickerson, manager, Basin, Jefferson Co., Mont. Lands are developed by tunnel. Has steam and water power. Idle.

DILL GOLD & COPPER MINING CO.**WYOMING.**

Office: Prescott, Wis. Mine office: Rambler, Carbon Co., Wyo. W. T. Dill, president; Geo. S. Hollister, vice-president and treasurer; Edw. H. Wallace, secretary; Sören J. Sörenson, manager. Organized July, 1903, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 4 claims, in process of patenting, area 80 acres, lying immediately north of the Doane, in the Battle Lake district, opened by a 100' tunnel and shafts of 42' and 100', and said to have upwards of 1,000' of workings, showing several quartz veins, carrying more or less copper. Has a 40-h. p. boiler, 6x8" hoist and Cameron sinking pump. Idle.

DILLON CONSOLIDATED MINING & TUNNEL CO.**WYOMING.**

Mine office: Dillon, Carbon Co., Wyo. Organized 1904, to drive a 3,500' tunnel across the formation at Dillon, to cut 6 copper veins, located on surface. Apparently no work ever done.

DINGO COPPER MINING CO.**AUSTRALIA.**

Mine office: Essington, Rockley district, N. S. W., Australia. Produced circa 200 tons of high-grade hand-picked ore in 1901. Presumably idle.

DIRIGO-LA SAL GOLD & COPPER MINING CO.**UTAH.**

Office: care of C. S. Richardson, secretary, Salt Lake City, Utah. Geo. E. McCann, manager. Lands, 31 claims, area circa 600 acres, in the Deep Creek district of Utah.

DIVIDEND MINING & MILLING CO.**NEW MEXICO.**

Office: 65 Journal Bldg., Boston, Mass. Mine office: Estey, Socorro Co., N. M. J. M. Bryson, president; J. E. Simpson, vice-president; B. F. Coburn, secretary and treasurer; preceding officers, F. B. Street, J. Wm. Rice, Samuel Porter, A. G. Spear, Jas. E. Putman and Halbert E. Parkhurst, directors. Organized September, 1902, with capitalization \$3,000,000. Has authorized a \$150,000 bond issue, for five years, at 7%.

Lands, circa 2,000 acres, also sundry coal lands about 15 miles distant. About \$250,000 is supposed to have been expended on the mine, which shows a fair body of sulphide ore, carrying high values in copper, a little lead, and small values in gold and silver. Property has a 100-ton concentrator

and a small smelter, inherited from previous owners, the Estey Mining & Milling Co., and is said to plan installation of a larger smelter.

Property is considered a promising one, but the management is selling stock, yet declines to give a statement to the Copper Handbook, claiming that the company's business is its own affair. The advertising done by this company is indefensible, and must injure its standing in the eyes of all conservative investors. The company advertised, in the Boston newspapers, that it had received a shipment of "precious rich, virgin copper ore, taken from the Mocking Bird mine, in the famous copper strike, which is the biggest ever made in the southwest," also that "there has been no such opportunity for investment since the Calumet & Hecla and United Verde were first put on the market." Verbum sap.

DIXIE MINE.**UTAH.**

Owned by Utah & Eastern Copper Co.

DOANE MINE.**WYOMING.**

Controlled by Penn-Wyoming Copper Co.

DOANE-RAMBLER MINE.**WYOMING.**

Controlled by Penn-Wyoming Copper Co.

DOANE-VERDE MINING CO.**WYOMING.**

Office: 1301 Monadnock Bldg., Chicago, Ills. Letter returned unclaimed from former mine office, Rambler, Carbon Co., Wyo. John C. Clarke, president; Oliver S. Brown, vice-president; Robert H. Young, general manager. Organized June, 1902, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 7 claims, on which a little development work was done, in the hope of striking the extension of the Doane-Rambler ore body. Idle for several years.

DR. CARL PETERS ESTATES &**MOZAMBIQUE.****EXPLORATION CO., LTD.**

Title changed, October, 1903, to South-East Africa, Ltd.

DOGAMARU MINE.**JAPAN.**

Mine office: Ago-mura, Ochi-gori, Iwami, Japan. B. Hori, owner; J. Stajaki, general manager. Opened circa 1845, reopened 1873. Ore is chalcopyrite, associated with argentiferous galena, sphalerite, and iron pyrites, with quartz gangue. Principal vein, of 10' to 25' width, traverses granite-porphry, with frequent faults. Has steam and electric power and a small smelter, employing circa 600 hands. Production, 1900, was 551,164 lbs. fine copper and 16,056 momme fine silver.

DOGSKIN MINE.**NEVADA.**

Mine office: Reno, Washoe Co., Nev. Has copper-gold ores. Idle.

DOLCOATH MINES, LTD.**ENGLAND.**

Offices: 28, St. Swithin's Lane, London, E. C., Eng. Mine office: Camborne, Cornwall, Eng. F. Harvey, chairman; Oliver Wethered, vice-chairman; F. W. Thomas, secretary; R. A. Thomas, mine manager. Organized July 15, 1895, with capitalization £350,000, shares £1 par; issued, £285,114. Lands include the Dolcoath mine, held on a 60-year lease expiring June, 1955, under royalty, and the West Dolcoath mine, bought 1899.

Is the principal mine of Cornwall, and is a large producer of tin, also securing a little copper as a by-product. Main shaft is nearly one-half mile in depth. Net profits, for fiscal year 1905, were £13,720, and a 5% dividend was paid therefrom, last previous dividend having been 13%, in 1899.

DOLLY B. MINE.**COLORADO.**

Mine office: Leadville, Lake Co., Colo. P. K. Connelly, manager. Ores carry gold, silver, lead and copper. Has steam and electric power.

DOLLY HYDE MINE.**MARYLAND.**

Located in Frederick county, Maryland, and was the principal copper mine of the state, though never a large producer. Ores occur as malachite, bornite and chalcopryite, in limestone country rock. Idle for many years.

DOLLY VARDEN MINE.**COLORADO.**

Mine office: Sunset, Boulder Co., Colo. Garner & Ewing, owners; L. A. Ewing, manager. Ores carry gold and copper. Has steam power.

DOLORES COPPER MINING CO.**MEXICO.**

Dead. Property, at Matehuala, San Luis Potosí, Mexico, sold to Gugenheim Exploration Co.

DOMINGUEZ COPPER MINING CO.**COLORADO.**

Mine office: Delta, Delta Co., Colo. Lands, sundry claims near Dominguez Cañon. Idle for several years.

DOMINION COPPER CO., LTD.**BRITISH COLUMBIA.**

Office: care of Leopold Herrman, secretary and treasurer, 30 Broad St., New York. Mine office: Phoenix, B. C. Works office: Boundary Falls, Yale district, B. C. Employs 120 men. Hon. Warner Miller, president; Samuel Newhouse, general manager; Maurice M. Johnson, consulting engineer; Thos. R. Drummond, superintendent; John H. Sampson, mine superintendent; Wm. C. Thomas, smelter superintendent; Gerald B. Street, engineer. Was reorganized, 1906, with capitalization \$5,000,000, shares \$10 par. Bonds, \$1,000,000 authorized, at 6%, for 10 years; issued, \$100,000, sold to shareholders at \$90, accompanied by a bonus of \$200 in stock. Controls upwards of 75% of the shares of the Montreal & Boston Consolidated Mining & Smelting Co., Ltd., and probably will buy the balance and absorb the property of that company completely. Former officers of the company are alleged to have been dishonest, and a criminal action for an accounting has been brought against H. T. Pemberton, formerly general manager.

Lands, 15 claims, area 500 acres, also a smelter-site. Mining lands are in four groups, in the Phoenix, Deadwood, Wellington and Summit camps. Country rocks are limestone and greenstone, ore bodies occurring as contact veins, and largely as replacements in the greenstone. There are 8 different veins on the company's lands, all more or less developed, these having a generally north and south strike, with an average dip of about 40°, and averaging about 25' in width by 3,000' in known length.

The properties in the Phoenix camp are the Brooklyn, Stemwinder, Rawhide, Idaho, Montezuma and Standard mines, with an area of 363 acres. The Brooklyn mine has a 430' main shaft, with about 3,500' of workings, showing a 40' vein averaging circa 1.43% copper, 25c. silver and \$1.32 gold

per ton. Mine has reserves of 260,000 tons of ore, of about \$6 average value, and is producing about 250 tons daily.

The Stemwinder mine has a 200' shaft, with 1,200' of underground openings, on a vein parallel with and about 1,000' east of the Brooklyn vein, ore giving average assays of 1.4% copper, 25c. silver and \$1 gold per ton. Production is about 50 tons daily.

The Rawhide mine has a 180' shaft, with 600' of workings, exposing about 225,000 tons of ore averaging 1.4% copper, 25c. silver and 90c. gold per ton. Equipment includes a 500' Ingersoll-Sergeant air-compressor, operated by electric power.

The Idaho mine adjoins the Brooklyn and Granby mines. Development is by surface-cuts, with one short tunnel. The property is considered promising.

The Montezuma and Standard claims are but slightly developed.

The properties in the Deadwood camp include the Sunset, C. O. D., Crown Silver and Morrison mines, with a total area of 110 acres. The Sunset has shafts of 200' and 412', with large opencast workings, showing a large ore body, which is chiefly valuable for fluxing, the ore carrying an excess of iron, silica and lime, with small copper, silver and gold values. A trestle from the Sunset runs to a 2,000-ton ore-bin on the railroad siding, whence ore is shipped to the smelter. Mine equipment includes a 14x20" Jenckes duplex link-motion hoist, a 14x20" Lidgerwood double-cylinder hoist, and a 10-drill Ingersoll-Sergeant duplex air-compressor. Production is about 60 tons of ore daily.

The Crown Silver mine, adjoining the Sunset, has a 265' main shaft and an 890' tunnel, and to all practical intents and purposes is a part of the Sunset.

The Morrison mine is opened by a 230' shaft, with 4,300' of tunnels, showing about 250,000 tons of ore averaging about 0.6% copper, 0.5 oz. to 1 oz. silver and 0.2 oz. gold per ton, with an average value of about \$4 per ton. Equipment includes a 110-h. p. steam plant, with 7x9" hoist, and a 5-drill Rand air-compressor.

Property in the Summit camp includes a half interest in the Lancashire and a three-fourths interest in the Mountain Rose mine, with combined area of 74 acres. Ores of these mines are chiefly useful for fluxing, containing about 40% iron, with very small values in copper, silver and gold. The Mountain Rose shows a vein of about 20' width, and the Lancashire, which is slightly developed, shows a 15' vein of the same character.

The Athelstan and Jack Pot mines, area 34 acres, in the Wellington camp, are worked open-cast. These properties show a large outcrop of oxidized ore carrying low values in copper and silver, with \$7.50 gold per ton, and are expected to show low grade auriferous and argentiferous copper ores below the oxidized zone.

The smelter, at Boundary Falls, is 4 miles to 25 miles from the various mines. Connection is by the Canadian Pacific Railway, which gives a freight rate of 17c. per ton on Deadwood ore and 30c. per ton on ore from the

Phoenix and Summit camps. The smelter was much crowded for slag-room, but extra land has been secured therefor. The smelter was not properly located, or equipped, but is being overhauled and modernized by the present management. The plant was built by the Standard Pyritic Smelting Co., passing latter to the Montreal & Boston company. The plant is rated at 650 tons daily capacity, and is equipped with two 325-ton water-jacket blast-furnaces, 40x176" at the tuyeres, and a third furnace, 48x204", to be installed, will have a daily capacity of about 500 tons. The building is 120x182', having 16 ore-bins, each 10x24', in the building, and three large ore-bins and coke-bins outside, with railroad tracks running above. The dust-flue, 200' long, leads to a stack 112' high and 9' 6" in diameter. Slag is handled by a 7x12" locomotive, traversing a 40" track. Equipment includes a sampling plant, with crushers, rolls, Vezin and Bridgman automatic samplers, and belt conveyors. The smelter has No. 7 Connorsville blowers and a 250-light dynamo. A new machine shop is being built, and more extensive use will be made of electric power. The smelter works three 8-hour shifts, and product is a matte carrying about 45% copper, 13 oz. silver and 3 oz. gold per ton, which is shipped to the British Columbia smelter, at Greenwood, for refining. The smelter also does custom work.

Under the present management, the first furnace was blown in December 7, 1905, and the second in January, 1906. Net profits of \$17,400 are said to have been made from 15,000 tons ore smelted in January, 1906, and in April, 1906, the smelter was treating 650 tons daily, which will be increased to 1,100 tons during the year, and management estimates production for 1906 at about 5,000,000 lbs. fine copper. The new management is strong financially, and has the experience and ability to develop and equip the property adequately. It is expected that about \$1,000,000 will be expended in new work and equipment. The mines of this company, while very low in average grade, contain immense bodies of ore, and the property should become a large and profitable producer.

**DON CARLOS & EUREKA CONSOLIDATED
COPPER MINING CO.**

MEXICO.

Office: care of Sidney Witherbee, Detroit, Mich. Mine office: Nombre de Dios, Durango, Mex. Property includes the Don Carlos y Anexa, Eureka and other mines, located about 65 miles southeast of Durango. Vein is about 150' wide, and mixed, carrying small stringers and pockets of high-grade bornite, with gold and silver values, assaying 18% copper, 3 kgs. silver and 7 grams gold per ton. Production, about 75 tons of ore in three years. Property presumably idle.

DON CARLOS MINE.

MEXICO.

Office: care of Avery T. Holmes, owner, Laramie, Wyo. Mine office: Nacozari, Sonora, Mex. Main shaft, 120', shows ore running up to 43% copper, and from 60 oz. to 7,000 oz. silver per ton. Has shipped several carloads of high-grade ore to the El Paso smelter.

DON FULANO COPPER MINES, LTD.

SPAIN.

Offices: Dashwood House, London, E. C., Eng. Col. C. E. MacDonald,

chairman; C. J. Gersbach, secretary. Organized July 7, 1905, with capitalization £130,000, shares £1 par. Lands are sundry old Spanish copper mines.

DON JUAN MINE.**OREGON.**

Mine office: Geiser, Baker Co., Ore. N. H. Thibault, owner; D. D. McLeod, superintendent. Ores carry gold and copper. Has steam power and a 10-stamp mill.

DONA DORA MINING CO.**NEW MEXICO.**

Office: 220 Broadway, New York. Mine office: Kent, Donna Ana Co., N. M. Jos. Willetts, president; Edwin L. Scott, secretary and treasurer; G. W. Kent, general manager. Lands are sundry claims on the eastern slope of the Organ Mountains, developed by a 400' tunnel and a shallow shaft, on a 5' vein carrying copper, lead and gold values. Equipment includes a 150-ton concentrator, in process of erection, a 100-h. p. hoist, 10-drill Rand air-compressor and a small electric light plant.

DONA LOUISA COPPER & GOLD MINING CO.**MEXICO.**

Office: 42 Broadway, New York. Mine office: Coapa, Michoacán, Mex. Wm. A. Buckman, president; Chas. M. Heath, vice-president; Manuel L. Ward, secretary, treasurer and general manager; Patrick McKinney, superintendent; T. Richmond Crum, engineer. Organized April, 1903, under laws of Delaware, with capitalization \$1,500,000, shares \$5 par. Has paid dividends of \$4,200, on treasury stock, and is still selling shares.

Lands, 45 pertenencias, area 111 acres, in the Morelia district, 24 miles from the Mexican National Railway, but construction of a new line is planned from Morelia to Tacambara. Lands show 4 fissure veins, of which 2 are being developed, these averaging 3' width and giving assays of 9% to 63% copper, and up to 120 oz. silver and \$32 gold per ton, from oxidized ores, slightly developed by shafts and tunnels, recently retimbered. Equipment includes a 60-h. p. boiler, Lidgerwood hoist good for 1,000', and Cameron pumps. A 5-ton test shipment, January, 1906, netted \$59.62 per ton, and it is hoped to make regular shipments during 1906. Development and equipment of the mine seems to have been sensibly done, but the management is making the mistake of paying 10% dividends while selling stock, which naturally gives the property a bad standing, in the eyes of conservative investors.

DORA COPPER MINES, LTD.**TRANSVAAL.**

Offices: 34, Coleman St., London, E. C., Eng. Mine office: Pretoria, Transvaal, South Africa. W. Vaughan-Williams, chairman; J. H. Bailey, secretary. Organized May 10, 1905, with capitalization £150,000, shares £1 par; issued, £100,010. Lands, sundry undeveloped copper claims in the vicinity of Pretoria.

DORAN & GALLAGHER.**ARIZONA.**

Mine office: Paradise, Cochise Co, Arizona. Lands, 10 claims, opened by a 40' shaft and a 250' tunnel, showing melaconite assaying 10% and better in copper.

**GEWERKSCHAFT DES BLEI- UND KUPFER-
ERZBERGWERKE DOROTHEA.**

GERMANY.

Mine office: Jannowitz, Schlesien, Germany. Herman Schönfelder, agent. Has one shaft. Idle at last accounts.

DOROTHY MINE.

VIRGINIA.

Mine office: Virgilina, Halifax Co., Va. Shipped a small quantity of sulphide ore in 1900. Idle.

DOS CABEZOS CONSOLIDATED MINES CO.

ARIZONA.

Mine office: Dos Cabezos, Cochise Co., Ariz. Oscar W. Roberts, superintendent. Has auriferous and argentiferous copper ores, with steam power and a small smelter. Property considered promising. Idle.

DOS NACIONES MINING CO.

MEXICO.

Office: care of Pritchard, Hagen & Co., Bisbee, Ariz. Letter returned unclaimed from former mine office, La Cananea, Sonora, Mexico. Lands, sundry claims not far from the Cobre Grande mine of the Greene Consolidated, developed by a 115' shaft, bottomed in ore.

DOUBLE STANDARD GROUP.

ARIZONA.

Office and mines: Lochiel, Santa Cruz Co., Ariz. Frank Olsen, owner and manager. Ores carry copper, silver and lead. Presumably idle.

DOUGLAS COPPER CO.

MEXICO.

Office: 42 Broadway, New York. Mine office: Cocorit, Alamos, Sonora, Mexico. Theo. Douglas, president and general manager; Melbert B. Carey, first vice-president; Victor M. Tyler, second vice-president; John C. Rowe, secretary; Chas. Switzer, treasurer; Gustave M. Gouyard, consulting engineer; preceding officers, E. C. Frisbie, Max Muller, A. Heaton Robertson and John C. Rowe, directors; O. J. Riggs, mine superintendent; M. G. Magnuson, engineer; Eaton & Lewis and Fidel S. Pujol, counsel; Empire Trust Co., New York, registrar; American Audit Co., New York, auditor. Organized July 23, 1903, under laws of Maine, with capitalization \$3,000,000, shares \$5 par. Bonds, \$600,000 authorized, at 6%, dated September 1, 1904, due September 1, 1914, secured by first mortgage; issued, \$377,000. Statement, as of March 1, 1906, gave cash in depositories, \$166,478.21, with \$18,042.75 accounts receivable. Owns entire stock issue of Anita Copper Mines Co., S. A., which is the Mexican corporation of the Douglas Copper Co. Annual meeting, third Tuesday in January.

Lands, 494 acres of mining lands, a 115-acre millsite and 19,760 acres of ranch, timber and coal lands, in the Baroyeca division of the Alamos district. Ore bodies occur in a crush-zone, in series of bedded eruptives, consisting of diorite, andesite and trachyte, carrying various contact veins and replacements in the diorite, and showing a mineralized zone of about 115' average width, carrying cuprite, melaconite, malachite, azurite, chalcocite, covellite, bornite, chalcopyrite, brochantite and chrysocolla, from which average assays have been secured of 8.5% copper, 5.5 oz. silver and \$5 gold per ton. A 20-ton sample shipment, to the El Paso smelter, in 1905, gave returns of 22.2% copper, 7.4 oz. silver and 4.5 oz. gold per ton,

Development is by 5 shafts, No. 1, the main shaft, being about 600' deep. with nearly one mile of underground openings, estimated by management to place about 400,000 tons of ore in sight. Equipment includes steam and electric hoists, air-compressor, electric light plant, necessary shops and offices and 21 dwellings.

Property is some distance from the railway, but is expected to be served by a new line building from Guaymas. On March 9, 1906, management stated that installation of the first 250-ton unit of a 1,000-ton smelter was being started, this being planned to go into blast before close of the year. Previous statements in the press that the mine was concentrating and smelting 500 tons of ore daily were absolutely unfounded. Property is regarded as valuable, and the management seems efficient and progressive, but the standing of the company has been injured by brass-band methods of promotion.

DOUGLAS COPPER MINING CO.**NEVADA.**

Office: care of Thompson Campbell, receiver, Boston, Mass. Mine office: Yerington, Lyon Co., Nevada. Apparently succeeded the Douglas Mining & Smelting Co. Lands, 11 claims, considerably developed by tunnels, showing argentiferous and auriferous copper ores. Reduction plant is the old Bluestone smelter. Mine is 15 miles from the Southern Pacific Railway, with a freight rate of \$5 per ton to the road and \$5 railroad freight to the Salt Lake smelter. Ore is slightly auriferous and argentiferous covellite, running up to 50% copper, and the average of 1,000 tons shipped in 1905 was 14.5% copper.

DOUGLAS MINING & MILLING CO.**WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. O. G. Blaisdell, superintendent. Lands, adjoining the Rambler, in the Douglas Creek district, have shown cuprite carrying good assay values in gold. Idle.

DOUGLAS MINING & SMELTING CO.**NEVADA.**

Succeeded by Douglas Copper Mining Co., latter bankrupt, 1905.

DOUGLAS MOUNTAIN GOLD MINING & TUNNEL CO.**WASHINGTON.**

Office: 38 West Gay St., Columbus, Ohio. Mine office: Loomis, Okanogan county, Wash. G. E. Bazler, general manager; J. J. Bennett, superintendent. Lands, 20 claims, showing several veins of 7" to 8' width. A 50' tunnel, on the Little Falls claim, shows a 2' vein carrying auriferous chalcopryite, galena and iron pyrites. Management plans instalation of a machinery plant.

DOUGLAS REDUCTION WORKS.**ARIZONA.**

The metallurgical plant of the Copper Queen Consolidated Mining Co. **DOVER MINING CO.**

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. David Ellis, superintendent. Ores carry gold, silver and copper. Has steam power. **DRAGON COPPER CO.**

Office: 924 Columbus Ave., Boston, Mass. Moribund.

DRAGON COPPER MINING & SMELTING CO.**ARIZONA.**

Office: 310 Frost Bldg., Los Angeles, Cal. Mine office: Tombstone,

Cochise Co., Arizona. C. M. Renaud, president; W. Arthur Phipps, vice-president; G. H. Mosher, secretary and treasurer; Geo. M. Henry, general manager. Organized May, 1902, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 20 claims, area 400 acres, near the Middlemarch and opposite the Black Diamond, showing 3 contact veins between limestone and porphyry, giving assays of 16% copper, 11% lead and 14 oz. silver per ton, from azurite, malachite, bornite and chalcopyrite. Has 4 short tunnels and a 465' shaft, showing high-grade ore at bottom. Has steam power and a 34-h. p. hoist, good for depth of 1,000'. Is shipping ore, said to average about \$14 per ton, to the Copper Queen smelter, at Douglas. Money for operations, since 1903, has come mainly from advances of the directors, and company's financial condition is poor, but property is considered meritorious.

DRAGOON MINING CO.**ARIZONA.**

Office: 261 Broadway, New York. Mine office: Johnson, Cochise Co., Arizona. Geo. M. Jacocks, president; L. M. Clifford, general manager. Is controlled by Federal Copper Mining & Smelting Co. Idle.

DRAGOON MOUNTAIN MINING CO.**ARIZONA.**

Office: 533 Kearney St., San Francisco, Cal. Mine office: Pearce, Cochise Co., Ariz. Employs 12 men. Lee Wee, president; Chu C. Mow, vice-president; Louis Fon, secretary; Leung Ting Mai, treasurer; S. E. Lake, superintendent; California Safe Deposit & Trust Co., depository. Organized under laws of Arizona, with capitalization \$300,000. Lands are sundry claims near Middle Pass, in the Dragoon Mountains, opened by shaft and giving a promising showing of ores carrying copper, silver and gold. Company was organized by wealthy Chinese residents of San Francisco and Tombstone, Arizona, and is operating along business-like and modern lines. Production was begun, late in 1905, ores being hauled in wagons to Pearce, and shipped, via Benson, to the Copper Queen smelter, at Douglas, Arizona.

DROGSET KOBBERVAERK.**NORWAY.**

Mine office: Meldalen, Norway. Produced 2,718 tons of cupriferous pyrites in 1900. Presumably idle.

DRUMMERS DEVELOPMENT CO.**WASHINGTON.**

Office: 15 Jamison Bldg., Spokane, Wash. Mine office: Chelan, Chelan Co., Wash. R. D. Johnson, president; Thomas Maloney, secretary. Capitalization \$100,000, shares 10c. par. Development work has been very limited, but shows fair ore. Idle at last accounts.

DUBUQUE MINE.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Is said to have a 3' paystreak, on the 6' Dubuque vein, carrying native copper and melaconite, with good gold values.

DUCHESS MINING, MILLING & SMELTING CO.**WYOMING.**

Letters returned unclaimed from former office, Cheyenne, Wyo., and former mine office, Holmes, Albany Co., Wyo. Lands lie west of the Blanche.

DUCKTOWN COPPER MINES.

GEORGIA.

Mine office Pierceville, Fannin Co., Ga. Lands show sulphide ore slightly developed by shaft. Has steam power. Idle.

DUCKTOWN SULPHUR, COPPER, & IRON CO., LTD.

TENNESSEE.

Offices: 1, Gresham House, Old Broad St., London, E. C., Eng. Mine office: Isabella, Polk Co., Tenn. Col. Jas. LeGeyt Daniell, chairman. H. Godber, secretary; Joseph Gordon Gordon, managing director; Jas. Worley, auditor; W. H. Freeland, general manager; Chas. W. Kennrick, assistant general manager. Organized Feb. 16, 1891, with capitalization £75,000, shares £1 par; issued, £66,200, in 74,800 ordinary shares and 200 founders' of £1 each, profits being divisible on a basis of 7% plus one-half of net remaining profits to the ordinary shares, balance of profits going to the founders' shares. Debentures; £38,300, first mortgage, at 5% and £7,735 second mortgage, at 7%. Has paid dividends of 963% on issued ordinary capital, last dividend being 30%, in 1905, and has paid dividends of 19,114% on the founders' shares.

Lands include the Mary, Callowell and other mines, acquired at a cost of £68,057. Main shaft is 600' deep and ores are exclusively sulphide, averaging under 3% copper, without either other gold or silver values. Has steam and electric power. Smelter has a Herreshoff furnace with daily capacity of about 500 tons of crude ore, and a No. 6 Connorsville blower driven by a direct-connected engine. An important change in the smelting process was made in 1903, and instead of heap-roasting the ores, as formerly, the pyritic system is employed, this making a 20% matte in the first fusion and a 50% matte in the second fusion, the change in smelting methods cutting down the capacity of the furnace, but effecting a considerable economy in fuel charges. The change from roasted to raw ore is said to have effected a saving of about 3 cents per pound on the refined copper production. The process, and its intelligent and highly successful application, in both theory and practice, have been highly commended by metallurgists. The furnace at first lost 48% in tonnage efficiency, but this has been reduced to 16.5% net loss only. The smelter may be enlarged. In connection with the reduction works is a small acid plant. Production was 5,287,321 lbs. fine copper, in 1904, and 6,547,212 lbs. in 1905. The property is managed with great ability, and ranks second only to the Tennessee, as a producer, in the Appalachian field.

DUGWAY COPPER MINING CO.

UTAH.

O. F. Peterson, general manager. Lands are in the Deep Creek district of Utah. Has a 100' shaft on a 15' contact vein between limestone and porphyry. Ores assay 1% to 36% copper, up to 45% lead, 17 oz. silver and \$1.60 gold per ton. Presumably idle.

DUKE MINE.

NORTH CAROLINA.

Mine office: Roxboro, Person county, N. C. B. L. Duke, owner; Thos. Martin, superintendent. Lands, 470 acres. Property has 4 shafts, deepest 170'. Veins are fissures, ore having a gangue of quartz, epidote and calcite. Has a good steam power equipment. Presumably idle.

MINA LA DULCINEA.**CHILE.**

At Puquios, Copiapó, Atacama, Chile. Is owned by Copiapó Mining Co., Ltd.

DULUTH & ARIZONA COPPER MINING CO.**ARIZONA.**

Office: 219 West Superior St., Duluth, Minn. Letters returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. Chas. W. Ericson, president; Gideon Schelin, secretary. Organized circa 1902, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, south of Prescott, showing ores giving average assay values of 11% copper and \$6 gold per ton.

DULUTH-CHIRICAHUA DEVELOPMENT CO.**ARIZONA.**

Office: Duluth, Minn. Mine office: Paradise, Cochise Co., Ariz. Martin Pattison, president; Edward F. Sweeney, vice-president and general manager; Geo. H. Crosby, secretary and treasurer; preceding officers, Byron M. Pattison and Thomas Bardon, directors. Lands, 37 claims, including the Sullivan, Copperopolis and Horace Mountain groups. The Sullivan group, of 7 claims, circa 4 miles west of the Chiricahua Development Co., is slightly developed by open-cuts, showing leached copper ore and a little very rich ore, and has a 60' tunnel showing lead ore. The Copperopolis group, of 8 claims, near the Sullivan, is slightly developed. Management is good and property considered promising.

DUMP MINE.**COLORADO.**

Letter returned unclaimed from former mine office, Black Hawk, Colo.

DUNCAN GROUP.**ARIZONA.**

Office: care of John A. Duncan, owner, St. Joseph, Mo. Mine office: Paradise, Cochise Co., Ariz. Lands, several claims lying next south of Chiricahua Development Co.

DUNCAN GROUP.**CALIFORNIA.**

Office: care of W. C. Duncan, owner, Oroville, Cal. Mine office: Flournoys, Plumas Co., California. Lands, sundry claims, including the Copper King, on which a shallow shaft shows ore giving assays up to 9% copper and \$6 gold per ton. Presumably idle.

DUNCAN MINING & DEVELOPMENT CO., LTD. BRITISH COLUMBIA.

Lands, 4 claims, in the Cowichan Lake district, Victoria, B. C., which have given assays up to 4% copper, 50% lead, 5 oz. to 10 oz. silver and \$2.50 to \$5 gold per ton. Presumably idle since circa 1901.

DUNKIRK GOLD & SILVER MINING CO.**ARIZONA.**

Office and mine: Prescott, Yavapai Co., Arizona. Edw. Kinzle, superintendent, at last accounts. Has argentiferous and auriferous copper and lead sulphides, with gasoline power.

DUPLEX GOLD & COPPER MINING CO.

Office: 57-209 Washington St., Boston, Mass.

DUQUESNE MINING & REDUCTION CO.**ARIZONA.**

Office: care of Geo. Westinghouse, owner, 820 Pennsylvania Ave., Pittsburgh, Pa. Mine office: Washington, Santa Cruz Co., Arizona. J. F. Tener, agent; D. Stewart, manager. Lands, 800 acres, near the Pride of the

West and several miles south of the Mowry mine, in the Patagonia Mountains, showing a fissure vein between granite-porphry and limestone, carrying chalcopryite associated with sphalerite, galena and iron pyrites. Has a 650' shaft, with steam power, 100-ton concentrator and a small smelter. Idle, but owner said to plan construction of a railroad and the erection of a reduction plant. Property considered promising, but rail connections imperatively demanded.

COMPANIA MINERA DE COBRE DE DURANGO.**MEXICO.**

Letter returned unclaimed from former mine office: La Trinidad, Otaez, Durango, Mexico.

DURANGO COPPER SYNDICATE, LTD.**MEXICO.**

Dead. Lands sold, 1900, to Avino Mines of Mexico, Ltd.

DURANGO MINING CO.**MEXICO.**

Mine office: Yerba Buena, Durango, Mexico. Capitalization \$1,000,000. Lands, 5 claims. Presumably idle.

DURGEE MINE.**VIRGINIA.**

Owned by Person Consolidated Copper & Gold Mines Co.

DUTCH MILLER MINING & SMELTING CO.**WASHINGTON.**

Office: 202 Denny Way, Seattle, Wash. Mine office: Skykomish, Snohomish Co., Wash. H. P. Fogh, general manager. Lands show a vein with maximum width of 18', carrying auriferous chalcopryite, several small smelter shipments averaging net returns of \$37.65 per ton, opened by shaft, tunnel and open-cut, giving a promising showing of ore. Mine adjoins that of the Seattle-Boston Copper Co., and it is planned to permit production from both by construction of 8 miles of railway and an aerial tramway of 3½ miles. Management seems good and property is regarded as promising.

DUTTON MINE.**MONTANA.**

Owned by East Butte Mining Co.

DYER MINE.**UTAH.**

Mine office: Vernal, Uintah Co., Utah. Is said to have a small smelter and to have produced copper to the value of \$500,000.

DZANSULSKI WORKS.**RUSSIA.**

Sold, circa 1901, to Caucasus Copper Co., Ltd.

EAGLE & BLUE BELL MINING CO.**UTAH.**

Offices: 60 State St., Boston, Mass., and 700 McCormick Bldg., Salt Lake City, Utah. Mine office: Tintic, Juab Co., Utah. E. L. White, president; Willard F. Snyder, vice-president, Duncan McVichie, general manager; Walter S. McCormick, treasurer; H. H. Green, secretary and assistant treasurer; preceding officers and Jos. A. Coram, directors; Wm. Clarke, superintendent. Capitalization \$250,000, shares \$1 par. Control is held by the Bingham Consolidated Mining & Smelting Co., through ownership of \$190,000 stock, and about \$150,000 has been expended upon development, under the Bingham management.

Lands adjoin the Centennial-Eureka and show considerable ore bodies, carrying silicious copper and lead sulphides containing good values in gold

and silver. Has a new 1,000' main working shaft, bottomed in a 6' vein carrying ores of \$25 to \$30 per ton average value. The mine has considerable ore reserves, which are being increased steadily, and at the beginning of 1906 was shipping about 50 tons of silicious ore daily. Property has a powerful hoist and an adequate machinery plant.

EAGLE COPPER CO.

WYOMING.

Office: 1608 Wazee St., Denver, Colo. Letters returned unclaimed from former mine offices, Battle and Encampment, Carbon Co., Wyo. Property is the Gertrude mine, carrying auriferous copper ores, opened by two shallow shafts and equipped with a small steam plant.

EAGLE COPPER & GOLD MINING CO.

IDAHO.

Office: Wallace, Idaho. Mine office: Mullan, Shoshone Co., Idaho. Organized 1902, under laws of Idaho, by J. H. Nordquist, et al., with capitalization \$1,000,000, shares \$1 par. Lands, sundry claims near the Leslie, opened by a 150' tunnel, showing copper ore, associated with hematite.

EAGLE COPPER-GOLD MINING CO., OF ARIZONA.

ARIZONA.

Office: 1022 Garfield Bldg., Cleveland, Ohio. Mine office: Wickenburg, Maricopa Co., Arizona. Alex. M. Fulford, president; Benj. J. Perry, vice-president and general manager; Herbert E. Hudson, secretary and treasurer; Oscar Jennings, superintendent. Organized August, 1902, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area 95 acres, in the Blue Tank district, claimed to show 8 ore bodies, of which the principal one is said to be of 12' to 20' width, and to give assays of 10% copper, 10 oz. to 35 oz. silver and \$6 to \$18 gold per ton, from oxide, carbonate and sulphide ores, developed by shafts of 50' and 108'. Is not favorably regarded.

EAGLE COPPER MINING CO.

WASHINGTON.

Mine office: Chewelah, Stevens Co., Wash. M. Mitchell, superintendent. Lands, 3 claims, lying south of the Wonderful group, on Stevens Peak, opened by shaft and tunnel, showing auriferous and argentiferous lead and copper ores.

EAGLE METALLIC COPPER CO.

PENNSYLVANIA.

Letter returned unclaimed from former office, Belvidere, N. J. Henry D. Deshler, president; John S. Romig, treasurer; Miss Millie Deshler, secretary. Organized March, 1903, under laws of New Jersey, with capitalization \$500,000. Lands, in Adams county, Pennsylvania, include an old copper mine, never successful. Some development was done 1903-1904, by present company.

EAGLE MINING CO.

CALIFORNIA.

Mine office: Needles, San Bernardino Co., Cal. Presumably idle.

EAGLE RIVER COPPER CO.

MICHIGAN.

Office: 15 William St., New York. Organized June 28, 1883, as successor to the Eagle River Mining Co. Lands, 360 acres, all in Keweenaw county. Large majority of stock in Eagle River Copper Co. was held by the Central Mining Co., which sold its lands, 1905, to the Calumet & Hecla Mining Co. Eagle River presumably absorbed also by Calumet & Hecla.

EAST BUTTE EXTENSION COPPER MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Montana. Chas. J. Schatzlein, president; A. C. McCullom, vice-president; J. K. Heslet, treasurer; Frank H. Cooney, secretary and general manager. Organized April, 1906, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, sundry claims, held in fee and under bond and lease, lying west of the East Butte and between the Dutton, Belmont, and Pennsylvania mines, opened by the Wall, Kemper, Ramsdell, Maud S., and other shafts, mostly shallow. It is planned to develop by sinking a new 500' shaft.

EAST BUTTE MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Montana. Jas. A. Talbot, president; Frank M. Sullivan, secretary; Henry Mueller, treasurer; Patrick Wall, general manager; preceding officers and Chas. R. Leonard, directors; Jas. W. Neill, consulting engineer. Organized, circa 1905, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par; issued, \$2,000,000. Began business with \$150,000 cash.

Lands include the Dutton mine and 9 other fractional claims, these 10 claims having an area of 19 acres, with options on other property, in the southeastern part of the Butte camp, adjoining the Pennsylvania mine of the Boston & Montana, having total holdings, in fee and under option, of circa 350 acres, said to carry 21 distinct veins. The various properties have 10 shafts, of 50' to 350' depth. Principal property is the Dutton mine, having a two-compartment shaft of 350', which has been cut down to three compartments, and is to be sunk to 1,000' or 1,500' depth. It was expected that a depth of 500' would be reached by July, 1906, and crosscuts would be driven from that depth. The property carries the extension of the Glengarry vein, which is about 20' in width, with ore of rather low grade. The Oneida mine has a 250' shaft and has yielded considerable rich ore, ranging up to 16% in copper tenor. The Lassen mine has produced a little ore carrying up to 60% copper and 10 oz. silver per ton. The Yankee Boy is claimed to show a 9' vein of ore averaging 14% copper. The Yankee Boy property has an old 100-ton concentrator, and the management plans building a 500-ton concentrator, to cost about \$135,000.

Several of the properties, including the Dutton, are being worked under lease, by tributors, and a monthly production of about \$25,000 is secured by them, on which a net royalty of 25% is paid the company, this revenue providing for all ordinary development expenses. Published estimates of a daily production of 100 tons of 8% to 9%, ore from lessees, are much too high. About one-half of the production is smelting ore and one-half milling ore. Company hopes to begin 1907 with a daily production of 300 to 500 tons of ore. Management is good and property is regarded as promising.

EAST COLUSA MINE.**MONTANA.**

Owned by Boston & Montana Copper & Silver Mining Co.

EAST PACIFIC MINE.**MONTANA.**

Mine office: Windsor, Broadwater Co., Montana. Robt. A. Bell,

owner; F. A. Taylor, superintendent. Ores carry gold, silver and copper. Has steam power and a 25-ton smelter.

EAST-SIDE GOLD MINING CO.

ARIZONA.

Letter returned unclaimed from advertised office, Lambertville, N. J. Mine office: Bisbee, Cochise Co., Arizona. Chas. C. McCoy, president and general manager; E. C. Gallagher, secretary; W. A. Eckerly, assistant secretary and treasurer. Organized under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 9 claims, area 168 acres, circa 6 miles east of Bisbee, opened by shafts of 60' and 80', showing veins said to give assays of \$8 to \$265 gold per ton, with small copper values. Idle.

EASTERN NATIONAL COPPER CO., LTD.

NOVA SCOTIA.

Succeeded, 1904, by Cheticamp Copper Co., Ltd.

EASTERN STAR MINE.

ARIZONA.

Letter returned unclaimed from former mine office, Williams, Arizona.

EASTER SUNDAY MINING CO.

ARIZONA.

Office and mine: Bisbee, Cochise Co., Arizona. Has gold and copper ores. Idle, except for annual assessment work.

J. M. ECHEVARRIA.

CHILE.

Operates the Quilomenco mine, opened 1892, in the department of Illapel, Chile. Production averages about 100 tons fine copper yearly.

ECHO COPPER MINING & MILLING CO.

WYOMING.

Office: 413-95 Dearborn St., Chicago, Ills. Mine office: Rudefeha, Carbon Co., Wyo. Dr. Geo. Illingsworth, president; W. D. Meeker, vice-president; W. R. Stiles, secretary; W. T. Peryam, resident director. Organized December 21, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, area 80 acres, adjoining and paralleling the Ferris-Haggarty mine on the northeast, opened by a 114' shaft, showing copper stains.

ECHO GROUP.

WASHINGTON.

Letter returned unclaimed from former mine office, Winthrop, Wash.

ECHO MINING CO.

IDAHO.

Office and mine: Sandpoint, Kootenai Co., Idaho. John Elsasser, president and superintendent; W. R. Elsasser, manager; Geo. M. Walker, secretary. Lands, 4 claims, 2½ miles west of Sandpoint and three-fourths mile from Great Northern Railway. Has a fissure vein of 8' to 18' width, traversing granite, opened by tunnel and shaft, showing argentiferous and auriferous chalcopyrite and iron pyrites, with quartz gangue.

ECLIPSE-ARGO MINING CO.

MONTANA.

Office: Helena, Montana. Mine office: Canyon Ferry, Broadwater Co., Mont. Employs 20 men. W. F. Quade, president; M. H. Riordan, vice-president; A. W. Martin, secretary; F. L. Sizer, treasurer and general manager; preceding officers, A. B. Tolin and A. B. Cottingham, directors. J. Hieber, mill superintendent. Organized March, 1904, under laws of Montana, with capitalization \$300,000, shares \$1 par, as a merger of the Argo Gold & Copper Mining Co. and the Eclipse Gold & Copper

Mining Co. Lands, 5 patented claims, area 100 acres, also a 10 acre millsite, in the Hellgate district, showing a 10' fissure vein in slate, traced about one-half mile, carrying bornite and chalcopryite, assaying about 7% copper, opened by tunnels of 300' and 1,000', with 2,000' of workings. Has a 40-h. p. steam plant and a 40x85' log mill, of 40 tons daily capacity, equipped with 2 crushers, 10 gravity stamps and one Wilfley table. Production, 1903, was 204,570 lbs. fine copper.

ECLIPSE GOLD & COPPER MINING CO.

MONTANA.

Merged, 1904, in Eclipse-Argo Mining Co.

ECTON MINE.

ENGLAND.

An old and idle property in Staffordshire, England, owned by the Duke of Devonshire. Was opened in Roman times, and operated as recently as 1840. Depth is about 1,500'. Was the first English mine to use gunpowder for blasting, A. D. 1677, and the first to use wire rope for hoisting.

EDDY GOLD, SILVER & COPPER MINING CO.

ARIZONA.

Office: P. C. Box 596, Phoenix, Ariz. Mine office: Glendale, Maricopa Co., Ariz. F. L. Eddy, president and general manager; J. R. Aich, vice president, S. P. Donnell, secretary and treasurer. Organized Aug. 22, 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 10 claims, area 200 acres, also a 5-acre millsite, in the Frog Tank Mountains, Old Baldy district. Country rocks are porphyry and gneiss, showing a 3' fissure vein in porphyry, opened by six 10' pits, a shaft of 65' and tunnels of 55' and 105', showing oxide and carbonate ores, assaying 4% to 6% copper, 12% to 60% lead, 10 oz. to 62 oz. silver and \$5 to \$32 gold per ton. Idle.

EDISON MINING CO.

BRITISH COLUMBIA.

Mine office: Yreka, Vancouver Island, B. C. Lands adjoin the Yreka Copper Co., Ltd., and show good ore, Presumably idle.

EDMUNDIAN (MANICALAND) COPPER CO., LTD.

MOZAMBIQUE.

Voluntarily liquidated, July, 1902.

EDNA MAY MINING CO.

COLORADO.

Letter returned unclaimed from former mine office, Winfield, Colo.

EINASLEIGH EXPLORATION SYNDICATE, LTD.

AUSTRALIA.

Offices: 20, Copthall Ave., London, E. C., Eng. W. H. Woodhead, managing director; Thos. Mullett, secretary. Organized Aug. 16, 1899, with capitalization £4,000, shares £50 par; issued, £3,850. Lands, 100 acres, on the Einasleigh river, Gilbert county, Queensland, Australia. Idle.

EINASLEIGH FREEHOLD COPPER MINES, LTD.

AUSTRALIA.

Offices: 20, Copthall Ave., London, E. C., England, and A. M. P. Chambers, Edwards St., Brisbane, Queensland, Australia. Mine office: Einasleigh, Gilbert Co., Queensland, Australia. J. S. Smith-Winby, chairman; Wm. Henry Woodhead, managing director; Thos. Mullett, secretary; F. Hambridge, secretary in Brisbane; J. Adler, superintendent. Organized April 17, 1899, with capitalization £200,000, shares £1 par; issued, £180,000. Debentures, £32,000, at 6%. Lands, 120 acres, freehold, at junction of

Einasleigh and Copperfield rivers, also 20 acres adjacent, carrying iron ore for fluxing. Main shaft, 190'. Underground work has shown a promising ore body. Has a 32x75" water-jacket blast-furnace and made 104 long tons of copper and 1,330 oz. silver, from 1,009 tons of ore smelted, in 1901. Idle, but the proposed Etheridge extension of the Mareeba to Chillagoe Railway will pass within 12 miles, if built, and its construction doubtless would be followed by a resumption of work at the Einasleigh Freehold.

EINASLEIGH SOUTH BLOCKS.

AUSTRALIA.

Mine office: Einasleigh, Gilbert Co., Queensland, Australia. Lands, sundry claims lying south of the Einasleigh Freehold. Idle.

EISENMANN y CARDEÑAS.

MEXICO.

Mine office: Huacana, Ario, Michoacán, Mexico. Presumably idle.

EISFELDER KUPFERGEWERKSCHAFT.

GERMANY.

Mine office: Glücksbrunn, Saxe-Meiningen, Germany. Capitalization, 600,000 marks. W. A. Mertens, smelter superintendent. Was sinking two working shafts, at last accounts.

EL CAPITAN COPPER CO.

ARIZONA.

A swindle, perpetrated by the notorious Douglas, Lacey & Co. See description of Amalgamated Gold & Copper Co.

EL CARMEN COPPER CO.

MEXICO.

Office: 52 Front St., New York. Mine office: El Carmen, San Juan de Heredia, Durango, Mex. Thos. P. Ball, president; Stephen A. Levy, secretary and treasurer; I. Wayne Von Leer, general manager. Organized August, 1899, under laws of New York, with capitalization \$750,000, shares \$100 par. Lands, 400 acres, also 31,000 acres miscellaneous lands. Development has shown a considerable body of auriferous and argentiferous copper ore, of concentrating grade. Has a large pumping plant, with a 3½-mile pipe-line, and a 40-stamp mill. Is 45 miles from a railroad. Idle.

EL CARMEN MINING CO.

MEXICO.

Mine office: Los Bronces, via San Xavier, Sonora, Mexico. Organized 1905, under laws of Arizona.

EL COBRE MINES.

CUBA.

Office: 71 Broadway, New York. Mine office: El Cobre, Santiago de Cuba. Employed 250 men, at last accounts. Chas. F. Rand, president and treasurer; Wm. Astor Chanler, vice-president; preceding officers, L. H. Severance, Colgate Hoyt, James C. Colgate, E. J. Barney, E. C. Felton, Wm. Henry Yale, E. W. Oglebay and Claudio G. Mendoza, directors; Wm. C. Tegethoff, secretary, Pedro Aguilera, manager; Jennings S. Cox, Jr., consulting engineer; Morrison B. Yung, mine superintendent; Chas. H. Jones, metallurgist. Organized Jan. 19, 1902, under laws of West Virginia, with capitalization \$5,000,000, divided into \$1,500,000 preferred and \$3,500,000 common stock. Holdings of this company include the properties owned formerly by the Royal Consolidated Mines of El Cobre, Ltd., San José Mining Co., Santiago Copper Mining Co. and El Cobre Railroad Co. Annual meeting, first Tuesday in March.

El Cobre mines were opened by the Spanish, A. D. 1532, and probably

produced the first copper made in America, excepting the native copper taken from the Lake Superior mines by prehistoric workmen, the first product of the Cuban mines having been used for casting Spanish cannon. The properties were taken over, circa 1832, by a Hispano-English company, ore mined being shipped to Swansea for reduction. The custom-house records of Santiago are said to show exports of 610,210 tons of ore, valued at \$50,186,225 (probably in depreciated Spanish currency) from 1851 to 1869, inclusive, ores as shipped assaying from 12.69% upwards, and probably averaging about 16% in copper tenor. During the revolution of 1868, the big Cornish pump was burned, causing the flooding of the mines, which remained idle until 1902, when bought by the present company.

Property is 8 miles west of Santiago bay, on which the company has wharves, and El Cobre railway, owned by this corporation, connects the mines with the harbor and with the city of Santiago. The property shows 3 wide veins, with strong outcroppings for a distance of some 6,500'. The old workings were extensive, including some 40 shafts, of which the four deepest were about 1,200' each, with 17 miles of underground openings, the mine being timbered mainly with mahogany. During the rainy season the mine makes 500 to 1,200 gallons per minute, of strongly acid water, requiring pumps of composition metal, with lead or wood-lined pipes. The new pumps have a combined capacity of 5,000 gallons per minute, and the water, after forked from the mine, is leached over scrap-iron, producing cement copper to the value of about \$5,000 monthly. The old waste-dumps contain about 250,000 tons of rejected material, averaging circa 2% copper. Considerable ore has been blocked out in open-cuts, for stoping, this averaging about 4% copper, and the tenor can be improved by hand-sorting.

A 200-ton smelter is located at Punta Sal, on Santiago harbor, 9 miles from the mine, and connected therewith by El Cobre railroad, 9 miles in length, with termini at Punta Sal and at the mine. This railroad, owned by the company, has 2 locomotives and 40 cars. Fuel used at the mine is bituminous coal, costing \$4.35 per ton, and the smelter is planned to use coke, costing \$6.50 per ton. Late in 1905 the property was said to be shipping 10,000 tons of ore monthly, but the management, formerly quite communicative, has become very reticent, and will give out no returns of operations, which leads to the suspicion that all may not be going as favorably as had been planned.

EL COBRE MINING CO.

MEXICO.

Office: 248 Equitable Bldg., Denver, Colo. Mine office: Hermosillo, Sonora, Mex. Joseph D. Whitham, president and treasurer; A. S. Mackenzie, vice-president and general manager; Guy C. Clemens, secretary. Organized under laws of District of Columbia, with capitalization \$5,000,000, shares \$1 par. Lands, circa 1,000 acres, including La Gran Duquesa and Transvaal mines, also a smelter site, in the Ures district, about 60 miles east of Hermosillo, Sonora, Mexico, to which point there is a good wagon road. Ores are claimed to have given average smelter returns of 20.1% copper, 1.75 oz. silver and \$4 gold per ton. The company's fiscal agent, F. A. Wright,

of Chicago, advertised, October, 1904, that it was estimated by experts that on less than 50 acres of this ground the first ten feet in depth would give more than 500,000 tons of gold-copper ore that, when smelted, would yield a net profit of over \$10,000,000. The property may be all that could be desired, but such abominable lies necessarily place both management and property under suspicion.

EL DIAZ GOLD & COPPER CO.

MEXICO.

Letter returned unclaimed from former office, 332 Drexel Bldg., Philadelphia, Pa. Mine office: San Martin Hidalgo, Jalisco, Mexico. Daniel Lamont, Jr., president and trustee; Aubrey F. Lee, secretary; J. R. Williams, manager. Organized 1901, under laws of New Jersey, with capitalization \$1,600,000, shares \$1 par. Lands, 60 pertenencias, area circa 410 acres, including 12 old workings, in the Rancho de Papinto district of Jalisco. Mine is opened by tunnels and shafts. Equipment includes a 10-stamp mill, 25-ton chlorination plant and an 80-ton smelter.

ELDORA ENTERPRISE GOLD MINING CO.

COLORADO.

Mine office: Eldora, Gilpin Co., Col. Chas. W. Sheehan, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power and a 10-ton smelter.

EL DORADO COPPER MINING CO.

CALIFORNIA.

Succeeded, circa 1906, by Woodside-Eureka Mining Co.

ELDORADO GOLD MINING & MILLING CO.

UTAH.

Office: 549 25th St., Ogden, Utah. Mine office: Hot Springs, Box Elder Co. Utah. Don Maguire, manager. Ores carry silver, lead and copper. Presumably idle.

ELECTRA MINING & MILLING CO.

ARIZONA.

Office: care of Alfred Day, fiscal agent, P. O. Box 513, Steubenville, Ohio. Lands, somewhere in Arizona, are claimed to show ore giving average assays of \$27 per ton.

ELECTRIC IRON & STEEL CO.

CALIFORNIA.

A fraud, perpetrated by W. C. Brunson and J. W. Turner, who falsely claimed to own 7,000 acres of rich mining land, in Shasta county, California.

ELECTROLYTIC COPPER MINING & SMELTING CO.

OREGON.

Letter returned unclaimed from former mine office, Imnaha, Oregon.

EL FAVOR MINING CO.

MEXICO.

Office: San Diego, Cal. Mine office: Hostotipaquillo, Jalisco, Mexico. Lands, 10 pertenencias, lying circa 15 miles northwest of Hostotipaquillo, carrying 4 parallel veins of 4 to 10 metres width, opened by several old shafts and tunnels, and showing cupriferous silver-lead ores.

EL GLOBO MINING & MILLING CO.

MEXICO.

Office: care of Dr. G. W. Orr, Lake Linden, Mich. Organized 1905, under laws of Arizona, with capitalization \$400,000, shares \$100 par. Lands, sundry claims in Sonora, Mexico, lying circa 70 miles south of Douglas, Arizona.

ELITE GOLD & COPPER MINING CO.

WASHINGTON.

Dead. Gave deed to property, November 21, 1904.

KUPFERERZBERGWERK ELIZA.**GERMANY.**

Mine office: Mallau, Elsass-Lothringen, Germany. Idle.

ELIZABETH COPPER CO.

Office: 43 Exchange Place, New York. Mine office: South Strafford, Orange Co., Vermont. August Heckscher, president; F. A. Berthold, secretary and treasurer; John N. Judson, general manager; James W. Tyson, Jr., mine superintendent; J. J. Morrison, mill superintendent. Organized, 1905, under laws of New Jersey. Property is the old Elizabeth mine, opened 1793, for magnetic pyrites, used in making copperas. It being found, eventually, that the mine carried an average of about 3% copper, in the form of chalcopyrite, disseminated in pyrrhotite, the Elizabeth became the largest American copper producer, previous to the opening of the rich mines of Lake Superior. Ore bodies occur as lenses, in foliated micaceous schists, the lenses overlapping and wedging out at bottom. Main ore body at the Elizabeth has been mined for 700' in length, and at one point was 100' wide. Main tunnel is 1,340' long, and mine is estimated, by present management, to have about 300,000 tons of ore in sight. Equipment includes a steam plant and small smelter, also a concentrator using the Rowand magnetic separation process. Nearest railroad, 8 miles, is the Boston & Maine. Operations were resumed March, 1906, under present management.

ELIZABETH MINING CO.**VERMONT.**

Succeeded, 1905, by Elizabeth Copper Co.

ELK MOUNTAIN MINING & MILLING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. T. R. Smith, president; S. E. Phelps, secretary and treasurer; B. A. Kaylor, superintendent. Organized 1900, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 660 acres, patented, in the Upper Platte district, showing three 5' ore bodies, in limestone, giving assays of 15% copper and \$3 gold per ton, from chalcocite, bornite and chalcopyrite. Has 3 shafts, deepest 183', and an 85' tunnel, with steam and electric power. Idle.

ELLA COPPER MINING & DEVELOPMENT CO.**CALIFORNIA.**

Letter returned unclaimed from former office, San José, Cal. Lands, near the New Almaden cinnabar mine, are claimed to show a 40-vein of 10% copper ore, which is too good to be true.

ELLA MINE.**WASHINGTON.**

Lands, 10 claims, on the north slope of Mt. Ellemeham, Okanogan Co., Washington, showing 5 veins of 3' to 5' width, opened by sundry shallow shafts, short tunnels and open-cuts, showing ore giving assays of \$10 to \$33 per ton, in copper, lead, silver and gold.

ELLAMAR MINING CO.**ALASKA.**

Office: Ellamar, Prince of Wales Island, Alaska. This mine was the first copper producer in Alaska, beginning production circa 1901. Ore is shipped for smelting both to Tacoma and to the Alaska Smelting & Refining Company's smelter at Hadley, Prince of Wales Island. Mine is close

to the sea, hence ore shipments are made with comparative cheapness. Production, 1905, was about 20,000 tons of 10% ore, giving a net production of circa 2,000,000 pounds fine copper.

EL MAJIN COPPER CO.

MEXICO.

Letter returned unclaimed from former office, Hermosillo, Sonora, Mexico, with notation, "unknown."

ELM RIVER COPPER CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; preceding officers, John C. Watson, Stephen R. Dow and Chas. H. King, directors; Jas. Chynoweth, superintendent; A. D. Nicholas, purchasing agent; Old Colony Trust Co., Boston, registrar. Organized April 20, 1899, under laws of New Jersey, with capitalization \$1,200,000, shares \$12 par, fully paid. Annual meeting, third Wednesday in April, at Jersey City, New Jersey. Expended \$44,266.06 in 1905, ending the year with a balance of \$155,088.85.

Official returns to the state of Michigan, as of date January 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,200,000.00
Entire amount invested in real estate.....	626,411.99
Amount of personal estate.....	211,514.70
Amount of floating debt.....	2,490.62
Amount due company.....	2,333.80

Lands, 2,300 acres, in Section 6, Town 52 North, Range 35 West, Sections 1, 2, 11 and 12, Town 52 North, Range 36 West, and Section 36, Town 53 North, Range 36 West, also a millsite in Section 30, Town 54 North, Range 36 West, on the shore of Lake Superior. Nearly a complete cross-section of the Elm River tract has been secured by 5,000' of diamond drill borings, and considerable sinking and drifting has been done, on several cupriferous amygdaloids, at different points. Shafts No. 1 and No. 2, latter 200' deep, are on the Winona lode; No. 3 shaft, 100' deep, and No. 4 shaft, 50' deep, are on the Shawmut lode, and No. 5 is on an unidentified lode located by diamond drill. No. 1, the first shaft started by the company, was abandoned at depth of 100', but was reopened, 1903, owing to the improved showing secured at the Winona. Shaft is 9x14' in size, and is 800' in depth, sunk in the foot-wall of the Winona amygdaloid, at an angle of 72°. Crosscuts and drifts on the 500' level, 1904, showed a 35' amygdaloid, carrying copper in unpayable quantities. On the 800' level, drifts both north and south show a healthy amygdaloid of 12' to 16' width, but no profitable ground has been opened as yet. In crosscutting west from the Winona lode, 12 other cupriferous amygdaloidal beds were cut, but none were found of commercial value. Shaft has a duplex hoist, good for 1,000' depth, also 2 Burt marine boilers and a 4-drill air-compressor. Water is pumped from a dam by a Blake pump. Property has a 40x40' machine shop and smithy, 40x40' carpenter shop, 28x65' two-story warehouse, boarding-house with accommodations for 100 men, a schoolhouse

and a number of dwellings. Work is to be continued until the company makes a mine or uses up its resources, which is the correct policy to pursue, all other opinions to the contrary notwithstanding.

EL PROGRESO COPPER MINING CO.**MEXICO.**

Out of business, stockholders having been given shares of Imperial Corona Gold Mining Co. in exchange.

EL REY GOLD & COPPER MINING CO.**WYOMING.**

Succeeded, circa 1904, by Consolidated Gold, Copper & Coal Co.

ELSIE ADAIR COPPER MINING CO.**AUSTRALIA.**

Office: Port Augusta, South Australia. A. M. Hardy, manager. Has steam power and employed about 40 men, at last accounts.

EL SUEÑO MINING CO.**MEXICO.**

This company, having lands somewhere in the northern district of Baja California, Mexico, has a small smelter, known as El Cuernas de Venado, and made 69 kgs. of copper in 1903.

ELSIE MINING CO.**COLORADO.**

Has gone out of business at Winfield, Chaffee county, Colorado.

EL TRIUNFO CONSOLIDATED MINING CO.**MEXICO.**

Office: 52 West 45th St., New York. Letter returned unclaimed from alleged mine office, Bacoachi, Sonora, Mexico, with notation that no such company is in existence at that point, notwithstanding claims of the company, made at the same date, that it had in operation 3 mines near Bacoachi. A. C. Charlot, president; B. Granville, managing director. Organized under laws of Delaware, with capitalization \$2,000,000, shares \$1 par. Company bears every indication of being a stock-jobbing scheme for separating fools from their money.

EL VERDE GRANDE COPPER CO.**MEXICO.**

Office: care of Percy Sharpe, Nogales, Arizona. Letter returned unclaimed from former mine office, Imuris, Magdalena, Sonora, Mexico. Capitalization \$2,000,000, shares \$1 par. Lands are in the foothills of the Sierra Azul, 14 miles from Imuris, which is on the Sonora railroad.

ELY CENTRAL COPPER CO.**NEVADA.**

Office: 351-139 South 4th St., Philadelphia, Pa. Mine office: Ely, White Pine Co., Nevada. O. A. Turner, president; B. A. Hazell, vice-president; Leon Hampton, secretary; John W. Woodside, treasurer; Fred. S. Pheby, general manager. Organized April, 1906, under laws of Delaware, with capitalization \$12,000,000 shares \$1 par; issued, \$10,200,000. Trust Company of North America, Philadelphia, registrar. Lands, 470 acres, unpatented, in the Robinson district, showing limestone country rock carrying a mineralized dike of monzonite, containing estimated average values of 3% copper, 1 oz. silver and 40 cents gold per ton, the ore being distributed through a porphyritic dike of 3,000' estimated width. Ores are malachite near surface and chalcopyrite at a little depth. Has 250' of underground openings. Management expects to get railroad connections at Ely, during 1906. Plan of development includes prospecting with diamond drills, sinking a working shaft, and eventually building a 2,000-ton concentrator.

ELY MINE.

Now known as the Copperfield Mines.

ELY MINING & MILLING CO.

Office: care of Maj. H. P. Myton, president, Salt Lake City, Utah.
 Mine office: Ely, White Pine Co., Nev. J. W. Langley, secretary. Organized 1904, under laws of Utah.

EMERALD MINE.

Office: care of H. A. Robinson, Wheatland, Wyo.

EMERALD MINING & SMELTING CO.

Mine office: Santa Catarina del Norte, Baja California, Mexico. W. R. Ramsdell, superintendent. Property is La Esmeralda copper mine, opened by shafts.

SOCIEDAD MINERA EMMA LUISA.

Mine office: Taltal, Antofagasta, Chile. J. S. Marión, superintendent, at last accounts. Has auriferous copper ores, with steam power.

EMMA MINE.

Mine office: Eholt, Yale district, B. C. The British Columbia Copper Co., Ltd., owns three-fourths and the Hall Mining & Smelting Co., Ltd. owns one-fourth of this property.

EMMA MINE.

Held by Butte Copper & Zinc Co.

GEWERKSCHAFT EMMANUEL.

Mine office: Wülfrath, Rheinprovinz, Germany. Has a single shaft, developing zinc and copper ores.

EMMONS MINE.

Owned by Hercules Gold & Copper Co.

EMPIRE COPPER CO.

Dead. Lands now held by Pacific Consolidated Mining Co.

EMPIRE COPPER & GOLD MINING CO.

Office: 122 West Third St., Los Angeles, Cal. Mine office: Johnson, Cochise Co., Arizona. Employs 11 men. J. L. Brooks, president and general manager; M. J. Gress, vice-president; H. H. Morrow, secretary and treasurer; preceding officers, J. O. Pace, H. Hermanson, Angus Graham and M. M. Gustin, directors. Organized January 31, 1905, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Annual meeting, second Monday in January. Lands, 15 claims, area 300 acres, 2 miles from Johnson, near the Copper Chief property, in the Little Dragoon Mountains. Lands show a good iron capping, carrying a little carbonate ore. Development is by shafts of 25' and 60', and by tunnels of 50', 300' and 340', showing ore giving average assays of 17% copper, 4 oz. silver and \$2.80 gold per ton. Company plans continuous development, during 1906.

EMPIRE-GOLD BUG MINING CO.

Mine office: Empire, Clear Creek Co., Colo. W. P. Clough, superintendent, at last accounts. Has auriferous and argentiferous copper ores.

VERMONT.**NEVADA.****WYOMING.****MEXICO.****CHILE.****BRITISH COLUMBIA.****MONTANA.****GERMANY.****NORTH CAROLINA.****NEVADA.****ARIZONA.****COLORADO.**

EMPIRE MINE.

Mine office: Lochiel, Santa Cruz Co., Ariz. Stephen O'Connor, owner. Ores carry copper, silver and lead. Idle at last accounts.

EMPIRE MINES CO.

Mine office: Hanover, Donna Ana Co., N. M. J. W. Bible, superintendent. Property is the Ivanhoe mine, considerably developed, on a promising ore body. Has steam power and a 100-ton concentrator. Idle.

EMPIRE MINING CO.

Office: care of H. B. Coon, secretary, Utica, N. Y. Mine office: Bisbee, Cochise Co., Ariz. W. L. Scott, president; J. G. Pritchard, resident director; A. W. Daggett, treasurer; Alex. Erickson, superintendent. Organized June 27, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 10 claims, area 200 acres, near the Modern mine, opened by a 350' tunnel, claimed to show a 5' vein of auriferous and argenterous copper ore, carrying \$14 values per ton in a crosscut. Ore is found in small stringers, typical of this district. Was developing with one shift, March, 1906.

EMPIRE MINING CO.

Dead. Lands, in Keweenaw county, Michigan, sold, 1905, to Keweenaw Copper Co.

EMPIRE MINING CO.

Wound up, 1901. Lands were in Ontanagon county, Michigan.

EMPIRE SMELTING CO.

Succeeded, circa 1905, by Southwestern Smelting & Refining Co.

EMPIRE & STAR MINING, MILLING & SMELTING CO.

Dead. Succeeded by Hecla Mining Co.

EMPIRE TUNNEL & GOLD MINING, MILLING &**TRANSPORTATION CO.**

Office: Georgetown, Colo. Mine offices: Empire, Clear Creek Co., Colorado, and Leadville, Lake Co., Colorado. Frank A. Maxwell, president and manager; Clarence Jarbeau, secretary; Daniel Wall, superintendent at Empire; W. S. Jones, superintendent at Leadville. Property includes the Empire tunnel and gold mines, at Empire, and the Cloud City mine, at Leadville, carrying gold, silver, lead and copper ores, latter as sulphides. Has water power at Empire, and steam power at Leadville. Has a 50-ton concentrator, and employs circa 50 men.

ENCAMPMENT MINING CO.

Dead. Lost lands in 1903.

ENCINITAS COPPER & SMELTING CO.

Mine office: Encinitas, San Diego Co., Cal. J. Andrew Wauchope, superintendent. Is supposed to have a concentrator. Was working in a small way, May, 1905.

ENCINITO COPPER CO.

Dead. Succeeded, circa 1905, by Encinitas Copper & Smelting Co.

ENGELS COPPER MINING CO.

Office: 421 Market St., San Francisco, Cal. Mine office: Taylor-

ARIZONA.**NEW MEXICO.****ARIZONA.****MICHIGAN.****MICHIGAN.****ARIZONA.****WYOMING.****COLORADO.****WYOMING.****CALIFORNIA.****CALIFORNIA.****CALIFORNIA.**

ville, Plumas Co., Cal. Has sulphide, carbonate and silicate ores, slightly developed, giving good assay values in copper, gold and silver.

ENGLISH & AUSTRALIAN COPPER CO., LTD.

AUSTRALIA.

Office: 102, Palmerston House, London, E. C., Eng. Works offices: Port Adelaide, South Australia, and Newcastle, New South Wales, Australia. John Harvey, chairman; Wm. Owen Robinson deputy-chairman; W. R. Caldwell-Moore, secretary; F. S. Chany, general manager; F. Cash, smelter superintendent. Organized 1851, capitalization reduced to £150,000, shares 30s. par; issued £102,988. Debentures, £31,050 outstanding, at 6%. Paid dividends of 54%, 1871-1873; last dividend, 1s., 1904. Property includes smelting works at Newcastle and Port Adelaide, the two plants employing 100 men, also an interest of 3,904 shares in the Clara St. Dora Copper Mining Co.

ENTERPRISE MILL & MINING CO.

COLORADO.

Mine office: Eldora, Gilpin Co., Colo. J. T. Mitchell, manager. Has cupriferos and gold silver ores, with steam power, concentrator and 50-ton chlorination plant, employing about 25 men, at last accounts.

ENTERPRISE MINE.

ARIZONA.

Mine office: Kingman, Mohave Co. Ariz. Lands, sundry claims in the Wallapai Mountains, about 17 miles east of Kingman, opened by a 200' shaft, said to show a big body of argentiferous and auriferous copper ore.

ENTERPRISE MINING & MILLING CO.

NEW MEXICO.

Office: care of W. B. De Shon, secretary and treasurer, Pittsburg, Pa. Mine office: Cooney, Socorro Co., N. M. Geo. A. Freeman, vice-president and general manager. Lands, 2 claims, opened by a 130' shaft, showing a 4' ore body, which has given assays of \$40 per ton, and a shaft of 200', said to be bottomed in a 10' vein. Values are principally gold. A new stamp-mill and concentrator are being built, with a concentrating capacity of 25 tons and stamping capacity of 8 tons daily. Has a 150-light electric plant.

EQUATOR MINING & SMELTING CO.

ARIZONA.

Office: 49 Wall St., New York. Mine office: Jerome, Yavapai Co., Ariz. Senator Wm. A. Clark, president; James A. McDonald, vice-president; Pierre V. C. Miller, secretary and treasurer; preceding officers, Chas. W. Clark and J. H. Anderson, directors. Organized March 19, 1900, under laws of West Virginia, with capitalization \$500,000, shares \$1 par.

Property, commonly known as the Iron King mine, is on Equator Hill, in the Agua Fria district, south of Jerome 4 miles by trail or 6 by wagon-road, and transportation from and to Jerome is by wagon. The property shows a mineralized zone ranging up to 600' in width, and traceable for upwards of 1,000' in a north and south direction. It was feared that the ore body was a blanket vein, but diamond drill borings show that it holds to depth, carrying auriferous and argentiferous copper ores of good grade. Mine is developed by a 300' main shaft, and is equipped with a substantial machinery plant. A 5,000' gravity tram-line connects the portal of the

upper tunnel with the roast-yard of the reduction plant. The smelter is rated at 250 tons daily capacity. Production was circa 800,000 lbs. fine copper, 1904, but mine and smelter were idle at last accounts. Management is good and property is generally considered valuable, though it has as yet failed to redeem the promise of its earlier stages.

ERIE CONSOLIDATED MINING & REDUCTION CO.

Dead. Name changed from Wahnita Copper Co. Both fraudulent.

ERIE COPPER MINING CO.

UTAH.

Office: 4 Atlas Blk., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Milford, Beaver Co., Utah. C. E. Albrook, president; L. G. Brown, secretary and general manager. Organized 1902, under laws of Utah, with capitalization \$1,500,000, shares \$1 par. Lands 15 claims, in the Beaver Lake district, showing fissure veins in granite, one of which, supposedly an extension of the O. K. of the Majestic, is developed by a 312' two-compartment shaft, showing oxidized ores at and near surface, with low-grade sulphides carrying occasional native copper in the lower workings. Has gasoline power.

ERIEGA COPPER & COAL MINING & SMELTING CO.

MONTANA.

Office: care of John F. Firch, president, Butte, Mont. Chas. Anceny, vice-president. Organized 1901, under laws of Montana, with capitalization \$1,000,000. Lands, 9 patented claims, area 185 acres, also 960 acres of coal lands, a 20-acre millsite and a 20-acre smelter-site, in the Bozeman district of Gallatin county, Montana, showing 2 fissure veins, averaging 30' width, claimed to give average values of 7 % copper, 30 oz. silver and \$10 gold per ton, mainly from sulphide ores, with occasional carbonates and native copper. Has shafts of 25', 40' and 80', and tunnels of 60' and 300'. Property apparently is of promise, but the officers of the company have poor standing, and company, being out of cash and credit, is moribund.

ERIE-ONTARIO DEVELOPMENT CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: care of Jas. Chynoweth, superintendent, Calumet, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, vice-president. Organized 1905, with capitalization \$50,000, shares \$10 par, fully paid.

Property, held under option, extended until Jan. 1, 1907, is 640 acres, including the old Erie and Ontario mines, in Sections 29, 30, 31 and 32, Town 53 North, Range 35 West, 7 miles south of the Champion and just midway between the Champion and Winona mines. The tract shows a copper-bearing lode, apparently the southerly continuation of the Baltic amygdaloid. The Erie and Ontario were worked in a small way, under great difficulties, circa 1855-1858, the only communication with the balance of the district being by a 10-mile wagon-road to Misery Bay, thence, from that miserable harbor, by water. Development was by shallow pits, from which some mass and barrel copper was taken. Work was begun, 1905, by present management, and in April, 1906, a shaft was down 142', and it was planned to crosscut at a depth of 200' or 300'. The shaft, sunk at 68°, runs into the

hanging wall. Lode is about 25' in width, being a healthy amygdaloid, carrying considerable epidote, but little copper. Conditions seem much similar to those at the Challenge mine, which is the nearest neighbor to the north. Machinery plant includes a 500' hoist and 4-drill air-compressor.

ERO COPPER CO.

Organized April, 1905, under laws of Maine.

COMPANÍA MINERA ESCUADRA, S. A.

MEXICO.

Mine office: Ocotlán, Oaxaca, Mexico. W. J. Carter, manager; E. G. Hart, superintendent. Ores carry gold, silver and copper. Mine is opened by tunnels and equipped with steam power.

ESCURIAL COPPER MINES, LTD.

SPAIN.

Offices: 4, Union Court, London, E. C., Eng., and Pelayo, 2, Barcelona, Spain. Mine office, Calmenarijos, Madrid, Spain. Jas. Taylor, chairman; Joaquin Lorena, mine manager; H. Gardiner, secretary. Organized Oct. 17, 1901, with capitalization £125,000, shares \$1 par; issued, £109,177. Lands, 342 acres, held under perpetual lease from the Spanish Government, including the Gloria, Ramón, Jaime and Nuestra Señora del Pilar mines. Work is confined to the latter, which shows 8 ore bodies and was worked by the ancients, either Romans or those who preceded them, to a depth of 135', by 3 shafts, with several drifts. Sundry small shipments of selected ore have given returns of 7.73% to 20.36% copper. Property considered promising.

ESMERALDA COPPER PRECIPITATING CO.

ARIZONA.

Office: 54 La Salle St., Chicago, Ills. Mine office: Ryan, Coconino Co., Arizona, via Kanab, Utah. Employs 16 men. R. H. Salter, president; Nicholas Noesges, secretary; Robt. Maney, treasurer; C. F. Drake, superintendent. Organized 1904, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Property is the mines and works of the Coconino Copper Co., held under lease, and which it is planned to make a producer, by use of the Neill leaching process.

ESMERALDA MINE.

MEXICO.

A company by this name, organized by W. R. Ramsdell, et al, began mining, 1900, in Baja California, Mexico, doing considerable work and shipping some ore, but veins pinched and grew low-grade, copper dropped in price, and work was suspended, circa 1902.

MINA ESMERALDA.

MEXICO.

Mine office: Cos, Sonora, Mex. Chas. Scott, superintendent, at last accounts. Lands, sundry claims, 18 miles east of Cos, carrying gold-copper ores. Presumably idle.

MINAS LA ESMERALDA y ANEXAS.

MEXICO.

Mine office: Chalchihuites, Zacatecas, Mexico. Leopoldo Viadero, manager. Ores carry gold, silver, lead and copper. Mine is opened by shafts and tunnels, and employed about 150 men, at last accounts.

ESNA DEVELOPMENT SYNDICATE, LTD.

NORWAY.

Organized, 1896, to take over a Norwegian mine, since abandoned.

SOCIEDAD MINERA ESPAÑOLA DEL NORTE DE ESPAÑA. SPAIN.

Mine office: Herrera de Río Pisuerga, Palencia, Spain. Don Federico Villanueva, president. Organized 1902. Lands include various concessions carrying coal, iron and copper.

SOCIEDAD ESPAÑOLA DE FUNDICIÓN. CHILE.

Operates Los Angeles mine, in the department of La Ligua, Chile, and is said to make matte equivalent to circa 650,000 lbs. fine copper yearly.

COMPAÑIA MINERA ESPERANZA y CONSTANCIA. MEXICO.

Mine office: Sierra Mojada, Coahuila, Mexico. Miguel Bernardino, manager. Operates La Fortuna mine, opened by a 350' shaft, equipped with steam power and producing silver, lead and copper. Employed circa 200 men, at last accounts.

ESPERANZA COPPER & SULPHUR CO., LTD. SPAIN.

Offices 74, Palmerston House, Old Broad St., London, E. C., Eng. Organized February 14, 1906, with capitalization £350,000, shares £1 par, to take over the Esperanza group, in the province of Huelva, Spain, from the Española Copper Syndicate, Ltd.

ESPERANZA MINING CO.. MEXICO.

Office: care of W. R. Nicholson, president, Land Title Bldg., Philadelphia, Pa. Mine office: Isla de Cedros, Baja California, Mexico. Employs 20 men. Geo. P. Brown, general manager; Harold Playter, superintendent; D. A. Conolly, smelter superintendent. Lands, 83 pertenencias, also 40 acres miscellaneous lands, on Cedros Island, in the Gulf of California. Country rock is diorite, showing 3 lenticular ore bodies, carrying carbonate and sulphide ores, estimated by company to average 40' width, 300' depth and 1,100' length, and to contain an average of 2.5% copper, 3% zinc, 2 oz. silver and \$3.50 gold per ton. Mine has been extensively developed, having about 8,500' of workings, showing circa 150,000 tons of low-grade ore, with about 100,000 tons blocked out for stoping. Property was opened 1891, closed 1901, reopened 1905. Surface gold ores change to basic copper ores at depth. Property has produced about \$450,000 in values, from shipment of high-grade ores to smelters at Denver, Pueblo, San Francisco and Tacoma. The great bulk of the ores being too low in grade to permit shipment for smelting, a reduction plant has been started at the mine. This will have a 50-ton blast-furnace, planned to turn out matte carrying 16% copper, 6 oz. silver and 1.5 oz. gold, to be sent to the Tacoma smelter for refining. Fuel at smelter is coke, costing \$18 per ton. Production, 1905, was circa 275,000 lbs. fine copper.

MINAS ESPERANZA y VISITACION. SPAIN.

Mine office: Albarracín, Teruel, Spain. D. Santiago Maorad, owner. Property is sundry iron mining lands, on which a promising lense of copper ore was discovered, 1903.

ESPIE BAY MINES DEVELOPMENT SYNDICATE, LTD. TURKEY IN ASIA.

Voluntarily wound up, June, 1904.

JOSÉ R. ESPINOZA.**CHILE.**

Office: Petorca, Aconcagua, Chile. Operates Las Palmas mine, opened 1880, making 100 to 150 tons copper yearly, also the Cantarito mine, opened 1898, making 50 tons of copper annually, both in the department of Petorca.

ALEXANDER ESQUER y CA.**MEXICO.**

Mine office: Baroyeca, Sonora, Mex. J. J. Esquer, manager. Operate the Mexicana, Esperanza and other mines, having ores carrying copper, gold and silver, opened by shafts and tunnels.

ESSEX COPPER CO.**MICHIGAN.**

Office: care of Marmaduke Richardson, president, 12 John St., New York. Alfred Meads, agent. Lands, in Ontonagon county, Michigan, have been sold, and company is being liquidated. Has paid \$1 per share, 1906, and a further dividend will be paid.

MINA ESTACA.**CHILE.**

Mine office: Chafñaral, Atacama, Chile. Cruz Hermanos, owners; R. Cruz, manager. Has steam power and employs about 50 men.

ESTERBROOK MINING CO.**WYOMING.**

Office and mine: Douglas, Converse Co., Wyo. Geo. W. Metcalf, president; John Foxton, secretary and treasurer. Organized 1897, under laws of Wyoming, with capitalization \$10,000; reorganized Sept. 9, 1903, with capitalization \$1,000,000; issued, \$490,000. Lands, 120 acres, also 120 acres miscellaneous lands, in Albany county, Wyoming, about 40 miles south of Douglas, showing a 4' fissure vein, in country rocks of diorite, schist and granite, giving assays of 2% to 4% copper, 25% to 30% lead, 2 oz. to 4 oz. silver and \$1 to \$2 gold per ton, from cerussite, galena, cuprite, chalcopryrite and native copper. Has 2 short tunnels and 5 shafts, deepest 284'. Company plans improving an available water power, and constructing a 100-ton concentrator.

ESTEY MINING & MILLING CO.**NEW MEXICO.**

Succeeded, circa 1902, by Dividend Mining & Milling Co.

COMPAGNIE LA ESTRELLA.**SPAIN.**

Office: Blvd. Haussmann, 16, Paris, France. Lands, sundry copper properties, in the province of Almeria, Spain. Presumably idle.

NUEVA SOCIEDAD PROPIETARIA LA ESTRELLA.**SPAIN.**

Office: Granada, Spain. Property is La Jerezana mine, in the province of Granada, Spain. Presumably idle.

ESTRELLA MINING CO.**UTAH.**

Mine office: Milford, Beaver Co., Utah. S. A. Turbet, superintendent. Lands, sundry claims, lying southwest of Milford, opened by a shaft said to be of 400' depth.

ETHEL CONSOLIDATED MINES CO.**WASHINGTON.**

Office and mine: Index, Snohomish Co., Wash. Geo. A. Pounder, president and general manager, at last accounts. Organized 1902, with capitalization \$3,500,000, shares \$1 par, succeeding the Ethel Copper Mining Co. and John D. Copper Co. Lands, 37 contiguous claims, carrying 21,000' of the strike of the vein. Principal development is on

the Ethel group, opened by a 2,000' tunnel, showing a considerable body of low-grade ore, carrying oxidized ores, bornite and chalcopyrite, with quartz gangue, claimed to average 4% copper, with small gold and silver values. Has a Pelton water-wheel and 75-ton concentrator, latter, connected with mine by a 4,000' gravity tram, having a crusher, rolls and Huntington mill. Ores slime badly in concentration. Company began the payment of 1% monthly dividends in 1903, and mine was shut down shortly thereafter. Property is under option to McAllister-Rowland Copper Mining Co.

ETHEL COPPER MINING CO.

WASHINGTON.

Succeeded, 1902, by Ethel Consolidated Mines Co.

ETHEL GOLD MINING CO.

COLORADO.

Office and mine: Turret, Chaffee Co., Colo. L. L. Miller, president; A. A. McKenzie, vice-president and superintendent; A. O. Olson, secretary. Organized May 20, 1901, with capitalization \$300,000, shares \$1 par. Lands are sundry gold claims in the Cripple Creek district, lead and silver claims in the Elk Mountain district, and copper, gold and graphite claims in the Turret Mountain district of Chaffee county, Colorado. Presumably idle.

ETNA MINING CO.

COLORADO.

Mine office: Georgetown, Clear Creek Co., Colo. W. D. Hoover, manager. Has a tunnel, showing ores carrying gold, silver, lead and copper.

ETRUSCAN COPPER ESTATES, LTD.

ITALY.

Offices: 139, Queen Victoria St., London, E. C., Eng. Mine office: Campiglia Marittima, Tuscany, Italy. Vavasour Earle, chairman; Alex. Hill & Stewart, mine managers; George Pepper, auditor; Henry Pope, secretary; Organized December, 1900, and reconstructed December 7, 1904, with capitalization £575,000, shares £1 par. Debentures, £200,000, at 6%, redeemable at 105, March, 1912.

Lands, 2,600 acres, of which 2,000 are freehold and balance held under perpetual mining rights, the property including the old Lanzi, Temporino and Rombola mines. These properties show numerous and extensive old workings, certainly as ancient as the Roman era, and probably dating back to Etruscan times. During the Nineteenth Century various Italian, French and English parties attempted, successively but unsuccessfully, to reopen these old mines, which are honeycombed by ancient inclines, adits, drifts, winzes and stopes. The properties were examined by C. Algernon Moreing, Edgar P. Rathbone, R. J. Frecheville, Alexander Hill and J. H. Fawcett. The three first named, who are eminent engineers of the highest professional standing, reported unfavorably. Mr. Moreing states that "the fact is, that poor as the showing is at the lead and blende mines, it is the only place where ore can be seen at all." Mr. Moreing later said that the official statements of the company to the shareholders, referring to colossal ore deposits, were absolutely incorrect, and that there are no such deposits in existence. For these statements the company sued Bewick, Moreing & Co., but dropped the suit, for reasons best known to the management

Mr. Rathbone said, "I do not consider that it would be possible to adopt any systematic method of mining which would pay expenses." Mr. Hill, also an eminent authority, says that the mine "possibly" might pay, with proper development. Mr. Fawcett thought enough of the showing to accept the management of the mine, but had the good sense to resign later, and recovered damages of £250 from Mr. Earle, for slander. Mr. Earle considers all experts incompetent, his own education, as a manufacturer of cement, having been peculiarly fitting for training the head of a copper mining company. The company claims to have 4 cupriferous veins, ranging 60' to 120' in width, nearly parallel and traceable $1\frac{1}{2}$ miles. Consensus of the best professional opinion is to the effect that the ore bodies, while undoubtedly extensive, are pockety and uncertain, and it is apparent that the principal values were removed by the ancients.

Development by the present company has been carried on at various points. The Walter vertical shaft, of 75 metres depth, at the Cava del Piombo mine, has opened several levels, stated to show a vein of 20x15 metres, in a section on the third level. This shaft has a 13-metre head-gear, with a two-cylinder hoist and three boilers. The Grand Cava shaft shows extensive old workings, as, for that matter, do practically all of the new openings. Operations have been suspended on the West vein. The Govett shaft, of 100 metres depth, shows extensive old workings, and little else. The Earle shaft, formerly the Coquand, 90 metres in depth, also shows many old workings. Le Marchant shaft, of 30 metres depth, with an 18-metre drift, shows heavy iron pyrites and a little chalcopyrite, with amphibole gangue. While the property is called a copper mine, it seems to be the practically unanimous opinion of experienced engineers, not connected with the company, that the principal values, doubtful as those may be, are in lead and zinc, rather than in copper.

The smelter, at Rombola, is connected by rail with the mines at Lanzi and Temporino. The reduction plant includes a concentrator and smelter, latter having a copper furnace of 100 tons nominal daily capacity.

In 1905, the management, having followed a consistent course of utter incompetency, engaged Alex. Hill to examine the mine, despite the contumely with which his report had been received three years previously. Mr. Hill's second report was identical with the first, with the addition of sensible advice for the salvage of the sadly mismanaged property. The management, being in a chastened frame of mind, seems inclined to do as Mr. Hill advises. The puttering smelting operations have been dropped, as only 625 tons fine copper were secured in all, and diamond drilling has been started. Despite claims of the management that the ore returned 2.68% copper, analysis of the figures shows returns of but 1.5%.

The Etruscan Copper Estates afford an unusually perfect specimen of bad management. The personal probity of Mr. Earle and his associates is not questioned, and they have squandered their own money as lavishly as that of the other shareholders, but the management, until finally humbled by the utter failure of its plans and promises, was phenomenally

arbitrary and ignorant. Under the competent management of Messrs. Alex. Hill & Stewart—if they are permitted to remain in charge—there is what may be termed a fighting chance, for the discovery and development of new ore bodies of payable quantity and quality.

EUCLID DEVELOPMENT CO.**ARIZONA.**

Mine office: Benson, Cochise Co., Ariz. Organized 1905, under laws of Arizona, with capitalization \$10,000, shares \$10 par.

EUREKA CONSOLIDATED MINING CO.**MEXICO.**

Mine office: Nombre de Dios, Durango, Mexico. Ores from surface are said to have assayed 2% copper and about 1 kilogram silver per ton.

EUREKA CONSOLIDATED MINING CO.**NEVADA.**

Succeeded, 1905, by Richmond-Eureka Mining Co.

EUREKA COPPER CO.**ARIZONA.**

Letters returned unclaimed from former office, 48 Wall St., New York. Lands, sundry claims, 8 miles west of Globe, Gila county, Arizona, showing a considerable body of low-grade ore. Idle for several years.

EUREKA COPPER MINES, LTD.**BRITISH COLUMBIA.**

Mine office: Nelson, Kootenay district, B. C. J. J. Malone, president. Organized 1906, under laws of British Columbia. Lands, 4 full and 3 fractional claims, including the Eureka mine, having a 150' shaft showing good auriferous copper ore, from which 1,000 tons have been shipped to the Trail smelter. Has a steam plant and employs circa 25 men.

EUREKA COPPER MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. L. B. Rodgers, president; O. B. Thompson, secretary; Bernard McCaffrey, treasurer. Organized November, 1899, and reorganized 1902, under laws of Utah, with capitalization \$500,000, shares \$1 par. Lands, 5 claims, 3 miles southeast of Encampment, opened by a 140' shaft. Made several small smelter shipments, 1903, but since idle, and supposed to owe about \$6,000 to promoters.

EUREKA DEVELOPMENT CO.**ARIZONA.**

Office and mine: care of S. S. Sutton, superintendent, Bisbee, Cochise Co., Ariz. Lands, sundry claims, circa 6 miles northwest of Bisbee, in Tombstone Cañon, near the Modern and Empire mines.

EUREKA DEVELOPMENT CO.**ARIZONA.**

Office: Calumet, Mich. Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz.

EUREKA EXPLORATION CO.**COLORADO.**

Office: Sioux City, Iowa. Mine office: Eureka, San Juan Co., Colo. J. H. Moreland, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, and a 50-ton concentrator. Employed about 25 men, at last accounts.

EUREKA GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Employs 4 men. C. W. Woods, president; H. M. Gibbs, secretary and treasurer; Harry Gilmore, superintendent. Lands, 8 claims, 7 miles south of Jerome, near the Iron King, opened by tunnel, showing a 30' vein with an 8' paystreak carry-

ing auriferous bornite and chalcopyrite, with occasional visible gold. Has steam power.

EUREKA GROUP.

CALIFORNIA.

Office: care of H. F. Dimock, Carrville, Cal. Lands, 2 claims, in Sections 17 and 18, T. 37 N., R. 7 W., Trinity county, California. Ore is silicious and low in grade. Has a 50' tunnel. Idle.

EUREKA HILL MINING CO.

UTAH.

Office: 11 East First South St., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Employs circa 60 men. Moylan C. Fox, president; Geo. W. Riter, secretary and managing engineer. Organized November 12, 1875, under laws of Utah, with capitalization \$1,000,000, shares \$100 par. Is operated as a close corporation, and has paid considerable dividends, but accounts are not published. Annual meeting, third Tuesday in February. Lands, 5 claims, area 27 acres, patented, also a 25-acre mill-site and 100 acres miscellaneous lands, in the Tintic district. Mine is extensively developed, having a 1,500' main working shaft, and about 25 miles of underground openings. Ore bodies are lenticular deposits, carrying cuprite, malachite and enargite, with average values of about 1.4% copper, 6% lead, 25 oz. silver and \$3 gold per ton. There is a 450-h. p., steam plant at the mine, and a 500-h. p. steam plant at the mill. Main hoist is 16x48', good for 1,600', and equipment includes a 30-drill Norwalk air-compressor. Buildings, 16 in number, include a 30x50' frame machine shop, 30x40' frame carpenter shop, frame smithies of 30x30', and 30x40', and a 30x60' foundry. The reduction plant includes a 25-ton combination mill, with concentrator and pan-amalgamation mill combined. Building is of wood, 240x250', and has 100 gravity stamps, 2 Blake crushers, 2 Gates centrifugal crushers and 50 vanners. The amalgamating plant has 32 pans. Company has a sawmill. Production is principally silver and lead, copper being secured as a by product. Production, 1904, was 134,000 lbs. fine copper.

EUREKA-MABEL MINE.

ARIZONA.

Letter returned unclaimed from former mine office, Patagonia, Santa Cruz Co., Ariz. Shipped one carload of hand-sorted ore, 1903, carrying argentiferous galena and tennantite.

EUREKA MINE.

HONDURAS.

A property in the Orica Basin, department of Tegucigalpa, Honduras, said to produce gold, silver and copper, latter in small quantities, as a by-product.

EUREKA MINE.

VERMONT.

Mine office: Corinth, Orange Co., Vt. E. L. Smith, general manager. Property includes the Eureka and Union mines, sometimes known as the Pike Hill mines. Presumably idle.

EUREKA MINING & MILLING CO.

ARIZONA.

Office: P. O. Box 552, Tombstone, Ariz. O. B. Steen, president; E. P. Draper, vice-president; F. W. Goodbody, secretary; F. N. Wolcott, treasurer. Lands, 7 claims, in the Huachuca Mountains, Cochise county, near the Mexican line. The Copper Glance group, opened by tunnels, is

claimed to have shipped more than \$100,000 worth of ore and concentrates, these giving smelter returns of about \$150 per ton, averaging 27% copper, 184 oz. silver and \$6 gold per ton. The Eureka group has produced about \$15,000 worth of ore. Property is considered valuable, but the company is a dead-beat. Idle.

EUREKA MINING, SMELTING & POWER CO.**OREGON.**

Office: P. O. Box 63, Clarkston, Wash. Mine office: Imnaha, Wallowa Co., Oregon. W. E. Howard, secretary; G. E. Nehrhood, superintendent. Company declines to furnish a statement, but claims to have a fair amount of cash in the treasury, with no debts. Lands, 40 claims, patents applied for, but adverses filed. Idle, except for slight development work during 1905, and lacks economical transportation. A suit was brought, 1905, in the United States Circuit Court, at Spokane, Washington, by August Miller and 44 other shareholders, who filed a bill in equity, asking that the company be compelled to refund approximately \$300,000, paid for 500,000 shares of stock sold to them, 1902, on fraudulent representations, by this company. It is asserted that the company claimed to have well developed mines, with much ore in sight and on the dump, and the plaintiffs allege that the company did not have 400 acres, or any other number, did not have any rich ore, any townsite, any water-power, any smelter-site, or any development of commercial value of any ore averaging over \$3 per ton.

EUREKA-OPHIR MINES.**UTAH.**

Office: care of J. W. Cairns, Stockton, Utah. Is said to show some high-grade ore. Idle.

EUREKA-RICHMOND MINING CO.**NEVADA.**

Office: care of Alfred Fries, 92 Reade St., New York. Mine office: Eureka, Eureka Co., Nev. A. F. Holden, managing director. Organized, circa 1905, as a merger of the Eureka Consolidated Mining Co. and Richmond Mining Co. Is under the general management of the United States Mining & Smelting Co., which holds a considerable stock interest.

EUSTIS MINES.**VIRGINIA.**

Owned by Holloway Mining Co.

EUSTIS MINING CO.**QUEBEC.**

Mine office: Sherbrooke, Sherbrooke Co., Quebec. Property carries cupriferous iron pyrites. Idle.

EVANGELINA COPPER MINING CO.**MEXICO.**

Office: 204-202½ So. Broadway, Los Angeles, Cal. Mine office: Santa Catarina, Ensenada de Todos Santos, Baja California, Mexico. D. R. Wilder, president; J. H. Coleman, vice-president; Josephine H. Wilder, secretary and treasurer. Lands, circa 150 acres, showing outcrops of 15% ore, in a fissure vein ranging from a few inches to 6' wide. Idle.

EVANS-TANZER CONSOLIDATED COPPER CO.**CALIFORNIA.**

Presumably dead.

EVELYN MINING & LEASING CO.**COLORADO.**

Mine office: Leadville, Lake Co., Colo. Morris Sterne, manager. Ores

carry gold, silver, lead, copper and zinc. Has steam power and employed about 40 men, at last accounts.

EVENING STAR MINING CO.

WYOMING.

Mine office: Riverside, Carbon Co., Wyo. J. H. Bills, superintendent, at last accounts. Lands, sundry claims, lying circa 12 miles south of Encampment, in the Beaver Creek district of Carbon county, opened by an 800' crosscut tunnel, showing a wide vein with a 2' paystreak carrying very high-grade melaconite, malachite and chalcocite. Is developing on a small scale.

EVERETT MINE.

NORTH CAROLINA.

Owned by North Carolina Copper Mining Co.

EVERGREEN BLUFF MINE.

MICHIGAN.

An old mine, lying south of the Adventure and Mass mines, in Ontonagon county, Michigan. Produced 675 tons, 1,174 lbs. fine copper, at a cost of \$223,582.24, from 1854 to 1863, but since idle.

EVERGREEN-EUREKA GOLD & COPPER CO.

Office: 31 Union Sq., New York. At last accounts was endeavoring to peddle stock, accompanied by a personal guaranty of 5% dividends, and a 10-year bond against loss. Evidently is a mere stock-jobbing scheme.

EVERGREEN GOLD & COPPER MINES CO.

COLORADO.

Office and mine: Apex, Gilpin Co., Colo. Jos. L. Walters, president and general manager; W. C. Hollister, secretary and treasurer. Organized 1904, under laws of Colorado, with capitalization \$500,000, shares \$1 par. Lands, 6 claims, 3 patented, area 33 acres, also a 10-acre placer claim and a half-acre millsite, in the Pine district, showing two fissure veins, of which one, opened by 3 shafts of 40' to 80' depth, and by tunnels of 150' and 400', carries malachite, bornite, chalcopyrite and tetrahedrite. Carload shipments, 1905, gave returns of 31% copper and 24 oz. silver from first grade ore, and 15% copper and 12 oz. silver from second grade ore. Construction of a small smelter is planned. Management is said to be conservative, and to be developing along sensible lines.

EVERGREEN MINING & TUNNEL CO.

UTAH.

Office: care of H. G. McMillan, manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. Has a prospecting tunnel, with about 1,700' of workings, said to show considerable low-grade copper ore.

EXCELSIOR COPPER CO.

ARIZONA.

A swindle, perpetrated by the notorious Wm. F. Wernse gang.

EXCELSIOR COPPER CO.

QUEBEC.

Mine office: West Broughton, Megantic Co., Quebec. Mine is developed by shaft and open-cuts. Has steam power. Presumably idle.

EXCELSIOR COPPER & GOLD MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Aetna, Wyo.

EXCELSIOR GOLD & COPPER MINING CO.

ARIZONA.

Office: Nevada Blk., San Francisco, Cal. Lands, 20 claims, in vicinity of Flagstaff, Coconino county, Arizona.

EXCELSIOR MINE.**NEW MEXICO.**

Mine office: Jarilla, Otero Co., N. M. Has a shaft, on the Nashville claim, said to show a 4' vein of 4% sulphide ore, and plans installation of a mining plant.

EXCELSIOR MINING CO.**NEW MEXICO.**

Letter returned unclaimed from former mine office, Organ, Donna Ana Co., New Mexico. Gilbert E. Dunbar, owner. Lands show argentiferous copper ore.

EXCELSIOR MINING & SMELTING CO.**NEVADA.**

Office: Butte, Mont. Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev. John F. Forbes, president; Frank E. Shaw, secretary. Capitalization \$200,000. Property was the Blue-stone mine, opened by tunnels, equipped with steam and gasoline power, and having oxide and carbonate ores, claimed to average 10% copper, with a 150-ton water-jacket furnace, installed 1901. Is thought property has passed to other hands.

FAEO GRUBE.**NORWAY.**

A group of small Norwegian mines, producing a limited quantity of ore, averaging 4% in copper tenor, at last accounts.

FAHLERZ- UND KUPFERKIESBERGBAU.**AUSTRIA.**

Mine office: Altsch Zafenschuh, Tyrol, Austria. Was a small producer of sulphide copper ore, at last accounts.

FAIRVIEW MINING CO.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Ores carry gold, silver and copper. Mine is opened by shaft and tunnel. Presumably idle.

FAMATINA COPPER & GOLD SYNDICATE, LTD.**ARGENTINA.**

Succeeded, Jan. 21, 1903, by Famatina Development Corporation, Ltd.

FAMATINA DEVELOPMENT CORPORATION, LTD.**ARGENTINA.**

Offices: 56, Cannon, St., London E. C., Eng. Mine office: Chilecito, Rioja, Argentina. Capt. W. B. McTaggart, chairman; Benito Villanueva, local director; John Taylor & Sons, consulting engineers; A. Dangerfield, secretary; E. Dangerfield, mine manager. Organized January 21, 1903, with capitalization £400,000, shares £1 par; issued, £266,268. Debentures, £100,000 authorized; issued, £70,100, at 6%, on first mortgage, redeemable at £105. Income bonds, £50,000, without interest, repayable at face, plus 25%, out of profits, and convertible into debentures. Succeeded the Famatina Copper & Gold Syndicate, Ltd.

Property is 4 groups of claims, in the Mexicana district, Famatina Mountains, known as the Mellizas group, area 75 acres, Upulungos group, area 7 acres, Compañía group, area 15 acres, and San Pedro group, area 45 acres. Property is claimed to show 14 auriferous and argentiferous copper veins, of 4' average width, by circa 2 miles in length. Company is alleged to practically control the Mexicana mining district, but area of lands reported does not seem to bear out this claim. The Upulungos mine is said to show a 1,000' ore chute. Property shows an intricate network

of fissure veins, traversing country rock of metamorphic slate, ores occurring in irregular chutes.

Smelter site is at Chilecito, and a 25-mile aerial tram is planned to connect the mines and works, it being estimated that this tram should cut the cost of transportation to a fraction of the present figure of 35 shillings per ton. The Córdoba Central railway is to be extended to the Mexicana district, eventually reaching Chilecito. Water is abundant, and wages for native labor, which is inefficient, average about 30 cents per day. Sample shipments of 900 long tons, put through the Chilecito smelter, 1905, are said to have given net profits of £2 per ton. Messrs. John Taylor & Sons, who are engineers of the highest standing, examined the property carefully, in 1905. Their report shows considerable ore, in veins ranging from a few inches to several feet in width, with average assays, from careful sampling, running 3% to 4% copper, 10 oz. to 15 oz. silver, and 4 dwts. to 5 dwts. gold per long ton. The report of the engineers recommends that nothing but development work be done for the present, reserving building of a reduction plant until the mines be more adequately developed. This report calls for the expenditure of about £100,000. The Famatina company, having reached the end of its resources, a new corporation has been formed, called the International Copper Co., Ltd., which is to finance the Famatina, up to £60,000.

LES MINES DE CUIVRE DE LA FARE, LTD.

FRANCE.

Offices: Dashwood House, New Broad St., London, E. C., Eng. R. Romeu, secretary. Organized Oct. 25, 1904, as Les Mines Françaises, name changed to present title, November, 1902, with capitalization £47,000, shares £1 par, in £30,000 cumulative 8% preference and £17,000 common shares; issued, £19,997. Property, in France, known as La Fare, is said to show 6 veins, and it is claimed that a reduction plant is being built.

COMPANIA MINERA DE FARELLON.

CHILE.

Mine office: Puquios, Copiapó, Atacama, Chile. Presumably an erroneous title for the Farellon mine of the Copiapó Mining Co., Ltd.

FARGO GOLD & COPPER MINING CO.

OREGON.

Office: Fargo, N. D. Mine office: Imnaha, Wallowa Co., Ore. H. M. Peterson, president; J. A. Husebye, secretary and treasurer; Charles Wallace, superintendent. Lands include the Last Chance mine, carrying auriferous and argentiferous copper ores. Has water power.

FARMINGTON GOLD & COPPER MINING & MILLING CO.

UTAH.

Office: care of J. Stuart Wallingford, secretary and treasurer, Paris, Ky. Mine office: Farmington, Davies Co., Utah. C. H. White, president; Anton Hartman, superintendent. Capitalization, \$250,000, shares \$1 par. Former manager, Fred. H. Perkins, was arrested, 1906, on charge of embezzling \$2,000 from the company.

FARRELL COPPER CO.

MONTANA.

Succeeded, circa 1902, by Pittsburg & Montana Copper Co.

FAUQUIER COPPER CO.

VIRGINIA.

Supposed to hold copper lands in Fauquier county, Virginia.

FAVORITE GOLD & COPPER MINING CO.**WASHINGTON.**

Office: Nelsonville, Ohio. Mine office: Nighthawk, Okanogan Co., Wash. J. M. Parker, president; J. F. Baldrige, secretary; H. D. James, general manager; Ed. Williams, mine superintendent. Lands, 14 full and 14 fractional claims, adjoining the Nighthawk mine, on Mt. Ellemeham, in the Wanicut Lake district, 34 miles from the Canadian Pacific railway, showing 5 veins, of which one, ranging 1' to 5' in width, is opened by a 950' upper tunnel and an 850' lower tunnel on the Giant claim, latter driven on a 3' vein of ore, showing values in lead, silver, copper and gold, principally the former.

MINA LA FÉ.**MEXICO.**

Mine office: Jimulco, Coahuila, Mexico. Pearson & Randall, owners; Geo. Pearson, manager. Ores carry copper, gold and silver. Presumably idle.

FEDERAL COPPER CO.**MICHIGAN.**

Office: 207 First Nat'l Bank Bldg., Duluth, Minn. Peter L. De Voist, president; F. D. Adams, secretary and treasurer. Organized 1902, under laws of Minnesota, with capitalization \$600,000, shares \$10 par. Lands, 360 acres, adjoining the Miskwabik, in Houghton township, Keweenaw county, Michigan. Property is supposed to carry the northern extension of the Kearsarge amygdaloid. Idle.

FEDERAL COPPER CO.**WYOMING.**

Letter returned unclaimed from former office, Laramie, Wyo. Was supposed to have lands in Carbon or Albany counties, Wyoming.

FEDERAL COPPER CO., LTD.**WISCONSIN.**

Apparently succeeded, circa 1902, by Federal Gold & Copper Co.

FEDERAL COPPER MINING & SMELTING CO.**ARIZONA, NEW MEXICO & TEXAS.**

Office: New York. Floyd H. Wilson, president; J. H. Russell, receiver, care of State National Bank, El Paso, Texas. Property was a 100-ton smelter, at El Paso, Texas, also mineral lands in the Organ Mountains, Donna Ana county, New Mexico, and a controlling interest in the Dragoon Mining Co., at Johnson, Cochise county, Arizona.

FEDERAL GOLD & COPPER CO.**NEVADA & WISCONSIN.**

Office: 214 Lumber Exchange, Minneapolis, Minn. Mine office: Dayton, Lyon Co., Nev. C. S. Dudley, president and general manager; M. B. Coburn, vice-president; H. S. Dudley, secretary and treasurer. Organized 1902, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands include 600 acres in the St. Croix valley, Burnett county, Wisconsin, and 520 acres 6 miles southeast of Superior, Douglas county, Wisconsin, these tracts lying on the St. Croix and Minong native copper ranges. Landed holdings in Nevada were 7 claims, in the Como district, including the Como-Eureka mine, showing 4 parallel veins, estimated by management to carry average values of \$8 to \$20 per ton. Mine has a 350' shaft, with 750' of drifts and crosscuts. Equipment includes an electric light plant and a 100-ton concentrator. Mill was run for several months, late in 1905, apparently for gold values, and produced about \$16,000. As management estimates

average cost of mining and milling at \$3.50 or less per ton, it is evident, either that value of ore has been overestimated, cost of mining and milling overestimated, or that amount of ore in sight is very small.

FEDERAL GOLD & COPPER MINING CO.

UTAH.

Office: 612 McCornick Bldg., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Hon. Heber Wells, president; A. Stuart, secretary; E. W. Young, general manager; J. E. Meyer, superintendent; W. A. Wilson, engineer. Organized Jan. 20, 1903, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Lands, said to be 9 patented claims, area 180 acres, in the Beaver Lake district, between the O. K. mine of the Majestic and the properties of the Newhouse company, but it has been asserted that there are adverbs on 4 claims. Property shows a number of fissure and contact veins, carrying gold, silver, copper and lead, in country rocks of granite-porphry, quartzite and limestone, opened by a 40' tunnel and 9 pits and shafts, deepest 80'. Was discovered and worked many years ago, producing about \$100,000 worth of ore. Property regarded as promising. Idle.

FEDERAL MINES CORPORATION.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Ores carry gold, silver, lead and copper. Has steam power.

FEDERAL MINING CO.

ARIZONA.

Reorganized, 1905, as Gila Valley Copper Co.

SOCIETA MINIERE DELLA FENICE MASSETANA.

ITALY.

Mine office: Massa Marittima, Grosseto, Italy. Property shows veins or lenses, ranging 6" to 65' in width, carrying chalcoppyrite, associated with iron pyrites, in a quartz gangue, and occasional native copper. First-grade ore, averaging about 11% copper, is heap-roasted at the mine and smelted at Leghorn, and second-grade ore, averaging about 3% copper, is heap-roasted and leached at the mine.

FENOCHIA MINING CO.

MEXICO.

Letter returned unclaimed from former mine office, Magdalena, Sonora, Mexico.

FENTRESS MINING CO.

NORTH CAROLINA.

Office: 52 Broadway, New York. Mine office: Center, Guilford Co., N. C. Henry J. Dexter, president; Chas. W. Scott, secretary. Property is the Fentress, or North Carolina mine, opened and worked previous to circa 1860. Has a 3' to 4' vein, dipping at 38° to 60°, opened to depth of 310'. Has steam power and 10-stamp mill, producing gold bullion and copper concentrates, when working. Presumably idle.

FERNANDO MINING CO.

MEXICO.

Office: 12 Ashburton Place, Boston, Mass. Mine office: San Fernando, Tamazula, Durango, Mex. Col. T. L. Livermore, treasurer; Courtney de Kalb, manager. Ores carry gold, silver and copper. Has water and electric power, with concentrator, and employed circa 250 men, at last accounts. Production, 1903, was 554,609 lbs. fine copper.

FERRIS-HAGGARTY COPPER MINING CO.**WYOMING.**

Controlled, through stock ownership, by Penn Wyoming Copper Co.

COMPANÍA DE MINAS FERROCOBRIZAS.**SPAIN.**

Office: San Isidro, 16, Sevilla, Spain. Mine office: El Carpio, Cortegana, Huelva, Spain. Don Salvador Sánchez Castañer, agent. Lands, 11 old mines, including the Santa Maria de Gracias, area 73 hectareas, leased to the Sociedad Francaise de Estudios, of Paris. Mines were worked in very ancient days. Ore is cupriferous iron pyrites, to be shipped, over a new railroad line, to Valdelamusa, for export.

MINAS FÉ y ESPERANZA.**SPAIN.**

Mine office: Ribas, Gerona, Spain. Are working on a small scale.

FIDELITY MINING CO., LTD.**MICHIGAN.**

Office: care of I. P. Griswold, chairman, Allegan, Mich. C. G. Turner, secretary; H. F. Marsh, treasurer. Organized February, 1903, with capitalization \$300,000. Lands are in Section 15, T. 50 N., R. 40 W., 2½ miles northwest of the Victoria mine, Ontonagon county, Michigan. No mining work done.

MINA FILOMENA.**CHILE.**

Mine office: Chañaral, Atacama, Chile. Baldomero Luna, owner; N. Rojas, superintendent. Has steam power, employing circa 50 men.

FINLETTER & HARVEY.**ARIZONA.**

Mine sold, 1905, to Keystone Copper Co.

FINLEY GOLD & COPPER MINING & MILLING CO.**UTAH.**

Letter returned unclaimed from former mine office, La Sal, Utah. C. A. Finley, general manager. Lands were 3 claims, at the foot of Horse Mountain, carrying ores giving returns of \$32.40 per ton, from small smelter shipments.

FIRE STEEL MINE.**MICHIGAN.**

Lands, 160 acres, being the NW ¼ of S. 22, T. 51 N., R. 37 W., Ontonagon county, Michigan. Opened 1852, closed 1855; since idle.

FIRMINA COPPER CO.

Organized June, 1905, under laws of Maine.

FIRST CHANCE MINING CO.**WASHINGTON.**

Mine office: Excelsior, Pierce Co., Wash. F. M. Lewis, president. Ores are refractory and company plans roasting them.

FISKUM SYNDICATE, LTD.**NORWAY.**

Offices: Basildon House, London, E. C., Eng. Mine office: Kongsberg, Norway. C. S. Goodwin, secretary. Organized March 2, 1905, with capitalization £2,400, shares £1 par; issued, £2,375. Property is an option on 50 claims, carrying copper, lead and zinc, on which a little work has been done.

FITZROY COPPER MINES, LTD.**AUSTRALIA.**

Offices: 11, St. Helen's Pl., London, E. C., England, and 79, Pitt St., Sydney, New South Wales, Australia. Mine office: Mt. Chalmers, Queensland, Australia. P. Charley, chairman; C. S. Goodwyn, secretary. Organized August 15, 1902, with capitalization £18,000, shares £1 par; issued,

£8,097. Property is the Mt. Chalmers mine, area 140 acres, near Rockhampton, reopened 1902, after many years' idleness, property being held under option of purchase. The mine has large lenses of ore, occurring in sedimentary rocks, in connection with dioritic intrusions. Ores are auriferous and slightly argentiferous iron-copper sulphides, giving average returns of about 1.5% copper, 1 dwt. silver and 4 dwts. gold per long ton. Property is 4 miles from a state railway. Equipment includes a small steam plant, mill with 20 gravity stamps and vanners, and a 60-ton smelter, but wet concentration does not seem to have given successful results, and mine should be worked open-cast.

FIVE METALS MINING CO.

ARKANSAS.

Correct title is North Arkansas Zinc, Copper, Lead, Silver & Gold Mining Co.

FIVE POINTS COPPER MINING CO.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. A. T. Hammons, treasurer; J. C. Britt, superintendent. Lands, sundry claims, including the Clark, Lockwood, and Van Wagenen groups, area 34 claims, lying near the Gibson Copper Co., 14 miles west of Globe, near the head of Pinto Creek, with 5 additional claims near Bloody Tanks. Property shows malachite, near surface, with some azurite and chalcocite at a little depth, and the company claims to have thousands of tons of 4% to 10% copper ore. Mine has given ores assaying up to 38% copper and 49 oz. silver per ton, with a trace of gold. The 350' Cracker Jim shaft shows a 29' vein, giving assays of 4% to 12% copper. The 150' Solace incline shaft is 1,500' from the Cracker Jim. An 80-h. p. first-motion hoist has been ordered, and plans have been drawn for a 325-ton concentrator. Shipments were begun, to the Old Dominion smelter, March, 17, 1906. Property is considered promising.

W. S. FLETCHER MINING & SMELTING CO. ARIZONA & CALIFORNIA.

Succeeded, March, 1905, by Arizona-Mexican Mining & Smelting Co.

FLINT STEEL MINE.

MICHIGAN.

A tract of 400 acres, near the Michigan mine, in Ontonagon county, Michigan. Produced 415 tons, 458 lbs. fine copper, at a considerable loss. Idle since circa 1875.

FLORENCE MINING CO.

UTAH.

A company by this name is said to have 640 acres, in the extreme eastern part of the Uintah Reservation, Utah, with a promising copper showing.

FLORENCE MINING, MILLING, SMELTING

COLORADO.

& REFINING CO.

Office: Florence, Colo. Lands, 18 claims, in Custer county, Colorado, showing a small vein giving good assays in copper. Presumably idle.

FLORENCE SMELTING, MINING & MILLING CO.

ARIZONA.

Office: care of J. H. McCabe, president and manager, Phoenix, Ariz. Mine office: Price, Pinal Co., Ariz. Lands include the Mineral Hill group, Grace, Blue Bell, Alice and other properties, having lead

and copper ores. Company has a smelter, with a 35-ton lead stack, apparently moved from Phoenix to Price, and is said to plan erection of a copper stack.

FLYING DUTCHMAN MINING CO.**UTAH.**

Lands are somewhere in Tooele county, Utah, near the property of the new Utah Mining Co. Herman Hoesh, superintendent.

F. M. & D. COPPER MINING CO.**COLORADO.**

Office: care of Bernard McCaffrey, Denver, Colo. Mine office: Morrison, Jefferson Co., Colo. Lands, 560 acres, patented, near Bear Creek, about 8 miles west of Morrison, opened by 600' of tunnels and a 165' main shaft, upper 150' passing through a gossan capping of 15' to 30' width, carrying small gold values, and showing about 5' of ore in the bottom, mainly sulphide, with some malachite, said to carry circa 11% copper and \$3.50 gold and silver per ton.

FOLDAL COPPER & SULPHUR CO., LTD.**NORWAY.**

Offices: 6, Old Jewry, London, E. C., Eng. Alex. Davidson, Leigh Hoskyns, Stanley Clay and Sidney St. J. Steadman, directors; Chas. Forbes, secretary. Organized 1906, with capitalization £350,000, shares £1 par, in 150,000 shares preferred and 200,000 shares ordinary stock. Lands are four old mines, known as the Juliana Marie, Knutshovd, Grev Moltke and Grimsdal, area circa 3,000 acres, in the Røros district of Norway. Properties were worked for about 150 years, and have produced circa 350,000 tons of ore. It is estimated by the management that about 250,000 long tons are now ready for stoping. Mines show a vein of circa 10' width, of practically solid cupriferous iron pyrites, said to average 2% copper and 46% sulphur, and, if this estimate holds good, the property scarcely can fail to make a profitable mine, under good management. An aerial tram or narrow-gauge railroad is required, for production to the best advantage.

FOND DU LAC MINE.**WISCONSIN.**

A prospect, in Douglas county, Wisconsin, on which two shafts, deepest 65', were sunk in 1899, giving a fine showing of native copper rock, said to have been brought from Michigan for the purpose.

FORAN MINE.**ARIZONA.**

Office and mine: Stoddard, Yavapai Co., Ariz. Samuel Foran, owner.

FORD COPPER CO.**COLORADO.**

Letter returned unclaimed from former mine office: Georgetown, Colo. Property, in Eldorado county, Colorado, was said to carry values in gold and copper, former predominating.

FOREST MINE.**WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Thos. Parks, superintendent. A prospect, slightly developed by tunnel. Presumably idle.

FOREST HILL CONSOLIDATED MINING & MILLING CO.**COLORADO.**

Office: 420 Exchange Bldg., Denver, Colo. Mine office: Tin Cup, Gunnison Co., Colo. L. Cavnah, president; J. C. Jensen, secretary and superintendent. Has steam power and two-stamp mill. Company has been endeavoring, since circa 1896, to develop gold, silver, lead or copper mines, at Tin Cup and elsewhere. Presumably idle.

EDWIN FORREST.**NEW MEXICO.**

Office and mine: High Rolls, Otero Co., N. M. Said to have claims, opened by 40' shaft, showing a 12' vein of copper ore.

COMPANIA MINERA LA FORTUNA.**MEXICO.**

Mine office: Tepezalá, Aguascalientes, Mexico. Geo. B. Wardman, superintendent. Operates La Fortuna and adjoining mines, opened by shafts, carrying copper and silver ores. Uses animal power and employs about 300 men.

FORTUNA COPPER CO.**CALIFORNIA.**

Office and mine: Fortuna, Humboldt Co., Cal. P. J. Mulley, president and general manager; Frank Legg, vice-president; C. A. Eastman, secretary; Fortuna Merchandising Co., treasurer; A. E. Purdy, superintendent. Organized June 8, 1901, under laws of California, with capitalization \$70,000, shares \$5 par. Lands, 32 claims, area 640 acres, in Trinity county, California, opened by tunnels of 60' and 270', showing ores that have assayed 28% copper and \$3 gold per ton, in veins of 12" to 16" width.

FORTUNA GOLD & COPPER CO.**ARIZONA.**

Office and mine: care of C. M. Clark, president, Phoenix, Maricopa Co., Arizona. Lands, 5 claims, including the Scarlet mine, circa 20 miles north of Phoenix, said to give a promising ore showing.

FORTUNA GRANDE COPPER CO.**NEVADA.**

Letter returned unclaimed from former mine office, Ely, Nevada.

FORTUNA GROUP.**CALIFORNIA.**

Office: care of E. G. Harrison, owner, Callahan, Cal. Lands are in Siskiyou county, California. Ore is chalcopyrite associated with pyrrhotite, traversing diorite, opened by shafts. Presumably idle.

FORTUNA MINING CO.**MEXICO.**

Office and mine: La Cananea, Sonora, Mexico. J. A. Daugherty, president and general manager; M. J. Thomas, vice-president; B. S. Pelzer, secretary; P. J. Tehaney, treasurer; Peter Kemp, superintendent. Organized July 3, 1905, under laws of Arizona, with capitalization \$1,500,000, shares \$5 par. Lands, 124 pertenencias, 20 miles south of Cananea, in the Sierra Azul Mountains. Property, opened by Mexicans, was abandoned, circa 1880, on account of water. Ores are argentiferous lead and copper, with lead values predominating.

FORTUNA MINING CO.**UTAH.**

Office: care of George F. Richards, Jr., secretary and treasurer, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 45 men. Simon Bamberger, president; Sidney Bamberger, general manager; J. Start, superintendent. Organized March 10, 1904, with capitalization \$300,000. Lands, circa 200 acres, adjoining the Ohio Copper Co., showing considerable development.

A blind shaft, starting from a tunnel, is planned to be deepened, on the vein. Property is said to show a 4' vein averaging 35% lead, 8 oz. silver and 0.08 oz. gold per ton, also a 7' vein averaging about 15% copper, but

these estimates are too high. Has a gasoline hoist and an old mill, which it is planned to equip with new concentrating tables. Property is regarded as promising.

FORTUNA MINING & MILLING CO.

UTAH.

This property, at Bingham Canyon, Salt Lake county, Utah, is under lease to, and is operated by, the Bingham Consolidated Mining & Smelting Co. **FORTUNE COPPER & FINANCE CO., LTD.**

Offices: 10, Basinghall St., London, E. C., Eng., Organized July 22, 1901, with capitalization £25,000.

FORTY-FIVE CONSOLIDATED MINING CO.

WASHINGTON.

Dead. Lands now held by Magus Mining Co.

FORTY-SEVEN MINE.

WASHINGTON.

Letter returned unclaimed from former mine office, Index, Wash. **FOSS RIVER CONSOLIDATED COPPER CO.**

WASHINGTON.

Office: 315 American National Bank Bldg., Everett, Wash. Employs 9 men. Albert McIntyre, president and general manager; E. A. Nickerson, vice-president; F. B. Smith, secretary; Leighton Howard-Smith, treasurer; Millnor Roberts, engineer. Organized December 10, 1901, under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Lands, 18 claims, area 33 acres, also a 30-acre millsite and 40 acres of timber lands, in the Foss River district of King county, Washington, opened by a 55' shaft and tunnels of 35', 45', 65' and 310', showing several veins, of which the largest, estimated at 180' width, shows bornite and chalcoppyrite, giving assays of 3% to 54% copper, 2 oz. to 40 oz. silver and 80 cents to \$44 gold per ton. Management plans continuation of development work and installation of water power and 4-drill air-compressor.

FOULD et COMPAGNIE.

SPAIN.

Office: Paris, France. Mine office: care of Don Guillermo Sundheim, agent, Huelva, Spain. Property includes La Cartagenera and other mines, at Cazalla de la Sierra, Sevilla, Spain, undergoing exploration at last accounts.

FOUR B'S MINING CO.

COLORADO.

Mine office: Turret, Chaffee Co., Colo. David Allen, superintendent at last accounts. Operates the Jasper mine, carrying gold, silver and copper ores. Has gasoline power.

FOUR BROTHERS MINE.

WASHINGTON.

Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Lands were 4 claims, having about 500' of development work, mainly tunnels, showing ores carrying copper gold and silver. Idle.

FOUR METALS MINING CO.

ARIZONA.

Office: 21 South Center St., Phoenix, Ariz. Mine office: Washington, Santa Cruz Co., Ariz. F. L. Blumer, president and treasurer; Oliver P. Morton, vice-president; H. A. Owen, secretary; Geo. D. Gross, manager; preceding officers and E. E. Barrett, directors. Organized 1903, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 40 claims, area 680 acres, south of the Mowry mines, in the Patagonia dis-

trict, opened by shaft and tunnel, with circa 3,500' of workings, showing ores giving fair assay values in copper, lead, silver and gold. A small test shipment of ore, from the Chamberlain tunnel, to the El Paso smelter, gave net returns of \$60 per ton. Management plans building a mill.

FOUR METALS MINING CO.

COLORADO.

Office: Equitable Bldg., St. Louis, Mo. Letter returned unclaimed from former mine office, Silverton, San Juan Co., Colo. W. Frank Carter, president; R. M. Scruggs, secretary and treasurer; Joseph H. Shockley, superintendent. Organized January 17, 1899, under laws of Colorado, with capitalization \$2,000,000, shares \$1 par. Lands were 47 claims, area 516 acres, at Silverton, San Juan county, and in Ingraham basin, near Telluride, San Miguel county, Colorado. Had a mill at the Palmyra mine, and a steam plant at the Andrus mine, near Telluride.

FOUR METALS MINING CO.

UTAH.

Office: care of G. L. Moats, general manager, Salt Lake City, Utah. H. Hugo Brandeis, president; R. P. Hill, secretary. Lands are in the Dugway, or Deep Creek district, Utah, and carry auriferous and argentiferous copper, zinc and lead ores. Mine is opened to depth of 400' and has a small concentrator. Presumably idle.

FOURTH OF JULY MINING & MILLING CO.

COLORADO.

Mine office: Eldora, Boulder Co., Colo. J. B. Johnson, superintendent. Is opened by shafts and has a 220' tunnel, planned to cut the Olympic and Fourth of July veins, from which assays of 25% to 45% copper, some lead, 50 oz. to 125 oz. silver, and \$30 to \$80 gold per ton, have been secured. Idle.

DUNCAN FOX & CO.

CHILE.

Mine office: Cobija, Tocopilla, Antofagasta, Chile. Firm owns a large number of copper claims, near Cobija and elsewhere, in the Tocopilla district of the province of Antofagasta.

SOCIÉTÉ DES MINES et FONDERIES DE FRANCAO.

CORSICA.

Mine office: Ajaccio, Corsica. Capitalization, 200,000 francs, shares 100 francs par. Lands are extensive, holdings, including the Morosaglia, San Lorenzo and other copper deposits, said to carry an average of 7% copper ore.

SOCIÉTÉ FRANCAISE DE ETUDIOS.

SPAIN.

Office: Paris, France. Mine office: El Carpio, Cortegana, Huelva, Spain. Property is sundry old mines of cupriferous iron pyrites, leased from the Compañía de Minas Ferrocobrizas.

COMPAGNIE FRANCAISE DES MINES DE

SPAIN.

CUIVRE D'AGUAS TENIDAS.

Succeeded by Société Française des Pyrites de Huelva.

COMPAGNIE FRANCAISE DES MINES DE

RUSSIA.

CUIVRE D'AKHTALA.

Offices: Rue Tronchet, 27 bis, Paris, France. Lands, sundry copper properties, in the Russian Caucasus. Presumably idle

SOCIÉTÉ FRANCAISE DES PYRITES DE HUELVA.**SPAIN.**

Offices: Rue de Chateaudun, 39, bis Paris, France. Mine office: Valdelamusa, Huelva, Spain. Don Carlos Marchal, agent; Victor Prevost, superintendent. Organized December, 1899, with capitalization 3,500,000 francs. Company succeeded the Société Française des Mines de Cuivre d'Agua Tenidas. Lands include sundry mines, among these being the Confesonarios at Valdelamusa, Perrunal and others at Cortegana, and El Carpio at Huelva. Product is cupriferous iron pyrites, and for 1904, production was 157,821 metric tons of raw ore, and 13 tons of cement copper. While low in copper tenor, the ores are rich in sulphur.

SOCIÉTÉ FRANCAISE MINIÈRE ET**SERVIA.****MÉTALURGIQUE EN SERBIE.**

Offices: Rue de Courcelles, 147, Paris, France. Lands are sundry copper claims in Servia.

ANDRES FRANCHY.**PERÚ.**

Mine office: San Marcelo, Yauli, Perú. Is a small producer of argentiferous copper ores.

SOCIÉTÉ MINIÈRE ET MÉTALURGIQUE**SPAIN.****FRANCO-ESPAGNOLE.**

Offices: Rue de Lisbonne, 8 bis, Paris, France:

FRANCISCO ARMANDAIZ SUCESORA.**MEXICO.**

Office: Apartado Postal 37, Monterey, N. L., Mex. Mine office: Cerralvo, Nuevo León, Mex. Property includes the Refugio and Barredon, which are producers of slightly argentiferous lead ores, and excellent properties, also the Colorado mine, carrying copper up to 3%. Properties employ about 50 men, and are said to be under bond and lease to New York parties.

FRANKLIN MINING CO.**MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Hancock, Houghton Co., Mich. Employs about 600 men. Francis H. Raymond, president; Daniel L. Demmon, secretary and treasurer; R. M. Edwards, manager; preceding officers, John C. Watson and Stephen R. Dow, directors; Cyrus Truan, mining captain at old Franklin; John Doney, mining captain at Franklin Junior; Arno Jaenig, clerk; Edward Warne, mill superintendent. Organized April 3, 1857, under laws of Michigan; reincorporated, 1887, for 30 years; capitalization since increased to \$2,500,000, shares \$25 par.

Official returns to the state of Michigan, as of date January 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,040,333.58
Entire amount invested in real estate.....	54,901.50
Amount of personal estate.....	234,575.81
Amount of floating debt.....	108,882.21
Amount paid in by conveyance of property is unknown, as old books were burned.	

Lands include 160 acres at the old Franklin, 1,359 acres of surface, and mineral rights to 160 acres, at the Franklin Junior, and a millsite at Grosse

Pointe of nearly 200 acres area with one mile frontage on Portage Lake. The old mine consists of the southwest quarter of Section 2, Town 55 North, Range 33 West. The Junior mine, opened 1860, as the Albany & Boston, was renamed the Peninsula in 1882, and was bought by the Franklin in 1895.

The old Franklin mine, opened on the Pewabic bed, is surrounded on three sides by the Quincy mine, which has cut off the Franklin from following the lode beyond the boundary line. The old Franklin is producing about 300 tons of rock daily from shaft No. 3, which is 3,200' deep, and No. 5, which is 2,850' deep, both bottomed at the Quincy line. Mining is almost exclusively scrambling old ground and robbing pillars, lower levels having been gutted. The pillars removed are usually of good grade, but the reworked ground varies greatly, ranging from the best grade of stamp rock and heavy copper down to almost barren rock. A little native silver is produced by the Pewabic lode, this being picked out by boys in the stamp mills. The old mine is nearing exhaustion, but has been at the point of death for ten years, and its vitality renders all predictions as to the date of its demise extra-hazardous. Parallel with the Pewabic lode, and lying 300' to the westward, is the so-called West Lode. This carries copper in variable quantities, but several fair stopes were developed thereon, during 1905, and are being worked through the old openings.

The Franklin Junior has two separate mines, these being the old Albany & Boston, on the Allouez conglomerate, which is the mine now worked, and a mine opened on the Pewabic amygdaloid, circa 1896-1899, the latter lying 475' west of and parallel with the first-named mine. The amygdaloid shafts are numbered from north to south, the north shaft being about 900' south of the Rhode Island line, and approximately 1,000' deep; No. 1 is 1,100' next south and about 1,600' deep; No. 2 is 1,500' further south and about 1,200' deep; No. 3 is 1,100' next south, and is about 400' in depth. The four shafts are sunk at an angle of $48^{\circ} 30'$, on a lode varying from 3' to 15' width, with an average of circa 9'. Average returns secured from this lode were only about 0.45%, or 9 lbs. fine copper per ton of rock crushed, hence the amygdaloid shafts were abandoned February, 1902, but at 2,000' to 2,500' depth a crosscut may be sent to the amygdaloid, from the conglomerate workings.

The results given by the Pewabic amygdaloid proving unsatisfactory, the old Albany & Boston mine, on the Allouez conglomerate, was reopened in 1900. No. 1 shaft was cut down to three-compartment size, 7x20' over all, with inside measurement of 6' 6"x18' 6". This shaft, 2,100' deep, has a direct hoist, raising 6-ton skips, good for one-mile depth. The two bottom levels of No. 1 are said to average as well as the Tamarack, the rock being softer and better mineralized below the 18th level. Water is forked from the conglomerate openings by a Cornish pump with 10' lift, the largest of this style in the Lake district, which probably is handling water as cheaply per foot-gallon as any pump in Michigan. The combination shaft-rockhouse is 40x50' on the ground, and 96' high.

No. 2 shaft, 1,200' south of No. 1, is 7'x18' 4" over all, and 1,200' in depth. It is sunk 3' under the footwall, to secure firm walls. The rock averages better than in No. 1, and the bottom levels are the best of the mine. The equipment includes a temporary shaft-rockhouse and straight-drum duplex-cylinder hoist, brought from No. 1 Amygdaloid shaft, good for 2,000' depth. It is planned to build a large shaft-rockhouse and install a new double-drum hoist good for 3,000' depth. In addition to the two shafts already opened, the Franklin Junior tract has room for two additional shafts, one each to the north and south of the present openings. The conglomerate lode averages 18' to 22' width, with an extreme width of 30', and 3' to 5' of lode-rock is left unmined on the hanging-wall, and no rock assortment attempted. The conglomerate is more regular in its copper contents than to the northward, where it is very buncy at the old Allouez mine.

In addition to the Allouez conglomerate and Pewabic amygdaloid, the Franklin Junior tract carries the Mesnard epidote, Calumet conglomerate and Osceola and Kearsarge amygdaloids, all supposed to have been opened by a 975' crosscut sent west from the fourth level on the Pewabic lode, this showing several amygdaloids, and one conglomerate carrying copper in unpromising quantities. The formation is found considerably disturbed at that depth, and a deeper crosscut may be driven eventually. Later developments to the northward having shown the Kearsarge amygdaloid to carry good values to within a mile or two of the Franklin Junior boundary, it was decided to test this bed on the Junior tract. Dr. L. L. Hubbard estimates, on data furnished by R. C. Pryor, that the Kearsarge amygdaloid should lie 1,308' horizontally east of the Allouez conglomerate, which would indicate that the old 975' crosscut, driven 1894, did not reach the Kearsarge lode. The crosscut, in consequence, is being extended eastward. Diamond drill borings lead to the hope that the Kearsarge bed may be found workable on the Franklin Junior lands.

Surface equipment at the Franklin Junior mine includes substantial and well-equipped machine, carpenter and blacksmith shops, engine-houses, boiler-houses, air-compressors of 10, 12 and 36 drill capacity, office, warehouse, dry-house and a considerable number of new and rebuilt dwellings for employes.

The stamp-mill, at Grosse Pointe, is served by the Mineral Range railroad. The building is of steel, on stone foundations, 177x194' in size, and has a self-supporting brick-lined smokestack of 7' diameter and 165' height, standing on a 52' brick foundation. The mill has four Allis-Chalmers two-way heads, with 20x24" cylinders, each treating an average of about 350 tons daily, equal to crushing 500 tons of softer amygdaloid rock. Each head has a 1,000-ton rock-bin, and is equipped with hydraulic separators, which take out considerable heavy copper. Each head has 20 rough jigs, 15 finisher jigs, round tables, and one Overstrom-table. The jigs are of the Hodge eccentric type, with center-shield copper discharges, which obviate skimming. Foundations are being built for a fifth head, which should be in commission late in 1906. As soon as the fifth head begins stamping, the

foundations of two old heads will be rebuilt. The mill has a 16x22" Allis-Chalmers engine, with steam supplied by two 500-h. p. Stirling water tube boilers. Water is furnished by an Allis-Chalmers 15,000,000-gallon vertical compound pump, with 12x42" high-pressure cylinders and 42x42" low-pressure cylinders, with 42" stroke and plungers 37.5" in diameter. Water is drawn through a 36" pipe-line running 200' into the lake, to a crib, protected by $\frac{1}{4}$ " screens. The mill has a 5x12" duplex fire-pump with a full outfit of hose, and a complete electric light plant. There is a 267' wharf at the millsite, with 18' of clear water alongside, this having coal-hoists and coal-sheds. There are about 20 dwellings at the millsite.

The mines are running 35 power drills at the Junior and 15 at the old Franklin, which produce about 1,400 tons of stamp rock daily, coming 300 tons from the old mine, 650 tons from No. 1 Junior and 450 tons from No. 2 Junior shaft. The Junior mine has about 30 mouths of advance openings and is being developed systematically, by drift-stopes, which are carried about 12' high and to the full width of the payable ground. Production, 1904, was 4,771,050 lbs. and 1905 was 4,206,085 lbs. fine copper. Earnings for 1905, including estimated value of copper on hand at end of year, were \$642,518.46, and expenditures were \$668,076.30, giving a net loss of \$25,557.84 on the year's operations. Production of 1905 would have been larger but for a strike. The average returns from rock stamped in 1905 was but 11.25 lbs. fine copper per ton, rendering the Franklin the lowest grade copper mine now worked in the world. Mineral is dressed very low, averaging about 50% copper only. Under the capable management of Mr. R. M. Edwards, the property is being developed systematically and extensively. The property is so low in grade that the only possibility of rendering it successful lies in producing upon a very large scale, with every economy in both mining and milling.

FRASER MOUNTAIN COPPER CO.

NEW MEXICO.

Office: Asbury Park, N. J. Mine office: Twining, Taos Co., N. M. Lands, 400 acres, partly patented, also a 7-acre millsite and 800 acres miscellaneous lands, in the Rio Hondo district, carrying 3 fissure veins partly developed, main vein being 50' to 60' wide and traceable 1,000', showing oxide, carbonate and sulphide ores. Development is by several shallow shafts and 6 tunnels, with about 2,000' of workings. Equipment includes a water-wheel, air-compressors, electric lights, shops, hotel and a general store. Has a 100-ton concentrator and a 125-ton smelter. Ores are claimed to average 4% copper, with good gold and silver values. Company was wrecked by the rascality of its management, and was sold at auction, 1905, but was bid in by a trustee for former shareholders, with a view to possible reorganization. Property thought to be of value, if properly developed and honestly managed.

FREE CUBA MINE.

CALIFORNIA.

Office and mine: care of Ira L. Houser, owner, Acton, Los Angeles Co., Cal. Mine, opened circa 1860, has a quartz vein 23' wide, with a 5' paystreak carrying native copper and high grade ore. Has steam power. Idle.

FREEHOLD MINE.

AUSTRALIA.

Mine office: Newellton, Queensland, Australia. Has ores assaying 10%

to 30 % copper and 12 oz. to 30 oz. silver per ton. Presumably idle.

FREELAND CONSOLIDATED MINES CO. COLORADO.

Succeeded, 1904, by Freeland Development & Transportation Co.

FREELAND DEVELOPMENT & TRANSPORTATION CO. COLORADO.

Office and mine: Idaho Springs, Clear Creek Co., Colo. J. R. McKinnie, president; Geo. E. Armstrong, secretary and treasurer; Geo. McClelland, general manager. Organized May, 1904, under laws of Colorado, with capitalization \$5,000,000, shares \$50 par. Lands, 130 claims, mainly patented, area upwards of 500 acres, also 30 acres of mill and smelter sites. Property was opened in 1861, and is extensively developed on fissure veins in granite, having produced upwards of \$5,000,000 in gold, silver, copper and lead, copper occurring as chalcopyrite. Ore is divided into two classes, of which the smelting ore has averaged \$35 net returns and the milling ore \$12 in values. The McClelland tunnel, 3,600' in length, will drain, ventilate and develop all the principal properties of the company, to depths of 1,300' to 3,000', and also connect them with the Colorado & Southern railway, which runs through the company's lands. Employed 30 men, at last accounts.

FREELAND EXTENSION MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Jas. A. Wilson, superintendent. Ores carry gold, silver, lead and copper. Has gasoline power. Presumably idle.

FREELAND MERCANTILE & MINING CO. COLORADO.

Dead.

FREMONT COPPER MINING CO. WYOMING.

Office: Fremont, Neb. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. Thos. Carroll, secretary and superintendent. Lands, in Purgatory Gulch, are opened by a 225' incline shaft, from which ore giving good assays has been secured. Has steam power. Presumably idle.

FRENCH CREEK MINES. PENNSYLVANIA.

Old and idle copper mines in Chester county, Pennsylvania.

FRESNO COPPER CO., LTD. CALIFORNIA.

Office: 188, St. Vincent St., Glasgow, Scotland. Mine office: Clovis, Fresno Co., Cal. John H. Graham, J. P., chairman; H. Grafton Vercoe, managing director at mines; J. M. Murray, secretary. Organized April 2, 1902, with capitalization £400,000, shares, £1 par; issued, £377,477. Lands, 480 acres in fee and 1,880 acres under option, near Pollasky, carrying a vein claimed to be 50' wide, on which 4 shallow shafts show ores assaying up to 7% copper and \$2 gold per ton. In 1905 was building a smelter with 2 small furnaces and a converter plant. New manager is said to have disposed of bulk of his personal shares, and the company does not seem to have made a very profound impression in California.

FRIDAY & LOWDEN. CALIFORNIA.

Office and mine: Redding, Shasta Co., Cal. Lands are a group of prospects, slightly developed by tunnels. Idle.

**SILBER- UND BLEIERZBERGWERK FRIEDRICHSSEGEN GERMANY.
AKTIEN-GESELLSCHAFT.**

Mine office: Friedrichslegen an den L., Hessen-Nassau, Germany. Max Rosenthal, president; C. Leuschner, superintendent. Production, 1903, was 380 metric tons of argentiferous lead ore, carrying 62.43% lead and 46.93 grams silver per ton; 5,524 metric tons of zinc ore, averaging 46.31% zinc; 50.25 tons of spathic iron ore, and 8 tons of copper ore averaging 12.1% copper and 11.64 grams silver per ton.

FRISCO CONTACT MINING CO.

UTAH.

Office: 209 Dooly Blk., Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Employs 10 men. D. P. Rohlfing, president and general manager; Patrick Ryan, vice-president; H. S. Young, secretary and treasurer. Organized, circa 1903, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 18 claims, area circa 340 acres, in the Frisco district, near the Horn Silver mine, showing four contact veins between limestone and andesite, one ranging up to 180' width, carrying ores that have given assays up to 20% copper, 45% lead, 3% zinc, 45 oz. silver and 80 cents gold per ton. Has 5 shafts, deepest 360', and circa 600' of tunnels, with about 2,000' of underground openings. Has a steam plant, hoists of 50-h. p. and 80-h. p., and necessary mine buildings. Company plans sinking main shaft to depth of 800', and drifting and crosscutting therefrom, at intervals of 100'.

FRISCO MINING CO.

UTAH.

Title changed, circa 1903, to Frisco Contact Mining Co.

FRONTENAC COPPER CO.

MICHIGAN.

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Quincy A. Shaw, Jr., president; Rudolph L. Agassiz, vice-president; James MacNaughton, general manager; preceding officers and F. W. Hunnewell, directors; Geo. A. Flagg, secretary and treasurer. Organized June 26, 1905, under laws of Michigan, with capitalization \$500,000, shares \$25 par. Annual meeting, in August. Is a subsidiary corporation of the Calumet & Hecla Mining Co., which owns the entire stock issue. Landed holdings are very extensive, amounting to 22,268 acres, in Keweenaw county, Michigan.

COMPAÑIA MINERA LA FRONTERIZA.

MEXICO.

Mine office: Cerralvo, Nuevo León, Mex. Ores carry silver and copper. Employed about 25 men, at last accounts.

FUJITA-KUMI & CO.

JAPAN.

Office: 180 Dojima-Kitamachi, Osaka, Japan. Mine office: Kosaka mura, Kazuno-gori, Rikuchu, Japan. Denzaburo Fujita, chairman; Heitaro Fujita, vice-chairman; R. Tanaka, general manager; S. Saito, mine superintendent; K. Takenouchi, smelter superintendent. Organized 1875, under laws of Japan, with capitalization £6,000,000.

Property includes the Kosaka and Towada mines, located in the midst of high mountains difficult of access. The Kosaka is 10 miles from the government railroad. Country rock is brecciated porphyry tuff, with intrusions of liparite and andesite, ore bodies occurring at the contact zone between the

tuff and andesite. Ore bodies occur as impregnations, ranging from 20' to 270' in width and from 300' to 450' in length, tested to depth of 480' under the outcrop. There are five of these ore bodies, the ores giving average returns of 2.3% copper, 1.5% lead and 0.8% zinc, from complex silicious sulphide ores. Development is by 9 shafts of 221', 159', 159', 159', 159', 159', 159', 120' and 41' and by 5 tunnels of 258', 714', 1,084', 1,212', and 2,080'. Mine, discovered 1860 and opened 1864, has been under the management of the present owners since 1884. The Kosaka is, without doubt, one of the best copper mines in Japan, and one of the big copper mines of the world, with further development. Power is generated by a turbine water-wheel, about 200 h. p. being used at the mine, 1,600 h. p. at the smelter and 200 h. p. for miscellaneous uses. Equipment includes two 8-drill Leyner air-compressors, 7 water Leyner power drills and 3 Gardner & Durkee electric drills. Improvements include a foundry covering 1,538 square yards, carpenter shop of 1,332 square yards, and boiler shop of 812 square yards, all of wood and brick.

The Towada mine, opened 1670, has a vein of 30' to 100' width, carrying disseminated auriferous chalcopyrite and argentite.

The smelter, one mile from the Kosaka mine, of 1,000 tons daily capacity, has 8 Herreshoff calcining furnaces, of which 6 are used on ore, one on matte and one on slags. There are 6 rectangular water-jacket blast-furnaces, of which 2 are used for matte smelting, 2 for anode casting, 1 for blister copper and 1 for ingot and cake copper. The plant presumably has an electrolytic refinery in connection, product being reported turned out as electrolytic copper of 99.95% tenor.

The company owns and operates two sawmills, and has 8 miles of private electric railroad, equipped with 10 electric locomotives and 400 three-ton ore cars. Fuel is bituminous coal, costing \$6.80 per long ton, and coke for blast-furnaces costs \$8 per long ton.

Production, 1905, was 9,238.42 oz. gold, 1,087,665 oz. silver and 13,984,768, lbs. fine copper, made from 311,413 long tons ore treated, giving average smelter returns of 2.3% copper, 3.5 oz. silver and 0.03 oz. gold per long ton. Estimated production for 1906 is 6,750 long tons fine copper. The property is under a progressive management, and production has been quadrupled in the past few years, with steady gains in output likely to continue for some years to come, the Kosaka being the most promising of the newer copper mines of Japan.

FUKADA MINE.

JAPAN.

Mine office: Fukada-mura, Kuma-gori, Higo, Japan. Country rocks are alternate strata of sandstone and clay-slate of Paleozoic age, ore body having strike and dip corresponding to country rocks, and ranging 5' to 10' in thickness. Ore is chalcopyrite, associated with iron pyrites, and averages 5% to 6% copper. Production, 1900, was 18,266 lbs. fine copper only.

FULTON MINE.

NEW MEXICO.

Letter returned unclaimed from former mine office, Ribera, San Miguel Co., N. M. Shipped several carloads of high-grade copper ore to smelter at Cerillos, 1902.

FUNATSU MINE.**JAPAN.**

Mine office: Funatsu, Hida, Japan. Has argentiferous copper ore and makes circa 500,000 lbs fine copper yearly.

COMPAÑIA MINERA FUNDIDORA y AFINADORA.**MEXICO.**

Office: Monterey, N. L., Mex. Mine office: Panuco de Coronado, Durango, Mex. Operates La Cruz y Anexas mines, producing silver, lead and copper. Employed an average force of about 50 men, at last accounts.

FURNACE CREEK MINING CO.**CALIFORNIA.**

Office: care of Patrick Clark, Spokane, Wash. Lands are sundry claims on Furnace Creek, near the Funeral Range, Death Valley, California, presumably in Inyo county. District is utterly arid, and all water is hauled in from a distance. It is expected that rail connection will be secured shortly.

DWIGHT FURNACE CO.**MEXICO.**

Office: Guanajuato, Mex. Mine office: Etzatlán, Jalisco, Mex. Dwight Furness, president; W. N. Cummings, manager. Lands include sundry groups of mines in the Etzatlán, Ameca and Hostotipaquillo district; of Jalisco, Mexico. The Santo Domingo group, 10 miles east of Hostotipaquillo, area 21 pertenencias, shows veins of 3' to 10' width, carrying gold and silver ores.

The Mina Grande group, 20 miles west of Hostotipaquillo, area 31 pertenencias, shows veins of 6' to 50' width, carrying native silver and gold, and sulphide silver ore. This property is fairly developed by shafts and tunnels, with considerable ore exposed.

The Casadas group, 25 miles west of Hostotipaquillo, area 21 pertenencias, shows veins of 3' to 10' width, carrying native gold and silver, and sulphide silver ore.

The Magistral y Anexas, 12 miles southwest of Ameca, area 24 pertenencias, shows a wide vein carrying paystreaks and chutes with workable values in argentiferous and auriferous oxide, carbonate and sulphide copper ores. Property is extensively developed by shafts and tunnels, but the ores of the oxidized zone are largely worked out, property having been operated extensively in the past, mainly for the production of copper sulphate and sulphuric acid.

The Calabaza group, 4 miles south of Etzatlán, area 24 pertenencias, shows 4 fissure veins of 4' to 12' width, carrying auriferous and argentiferous sphalerite and galena. Mine has 650' of workings and is estimated to have 20,000 tons of ore in sight.

The Auga Blanca group carries auriferous copper ore and argentiferous lead ore. Some of the properties of this company are of considerable promise.

FURUKAWA MINING CO.**JAPAN.**

Office: Mitsu Bishi Bldg., Yayasucho, Kojimachi-ku, Tokio, Japan. Principal mine offices: Ashio, Shimotsuke; Innai, Akita; Rioshikaso, Echigo; Aniai, Ugo, Japan. Junkiche Furukawa, president; R. Kondo, general manager; M. Otagawa, assistant manager; K. Asano, consulting engineer. Is the largest copper producer of Japan, property including 15 copper mines, 3 silver mines and 7 coal mines, the Ashio, Ani, Kusakura, Innai and Kune mines being the principal copper producers.

The Ashio mine, in the province of Shimotsuke, discovered A. D. 1610, was developed by the Tokugawa government, reaching a productive capacity of 2,000,000 to 3,000,000 lbs. fine copper yearly, in the latter half of the Seventeenth Century, and as this output was in excess of the home demand, the surplus was exported to Holland. The property came into possession of the Furukawa company in 1877, in such poor condition that its yield was only about 400,000 lbs. of copper yearly, but by good handling and careful development, coupled with the introduction of the most approved methods and modern machinery, has been made the foremost copper mine of Japan. The country rocks are Paleozoic clay-slate, sandstone and hornstone, with liparite intrusions, numerous metalliferous veins traversing the liparite but thinning out in the Paleozoic rocks. The property has 7 main veins, averaging 6' to 7' in width, all with sharp dips and carrying a little bornite and melanconite in the upper levels, principal values being in chalcopyrite, associated with galena, sphalerite, arsenopyrite and iron pyrite, these ores having a quartz and clay gangue. The deepest mine openings are about 1,200' and the ores give average smelter returns of about 4% copper, with small silver values. The nearest railroad station is Nikko, distant 9 miles over the mountains from Ashio. Supplies are brought in tram-cars, hauled by bullocks to the foot of the mountains, 5 miles from Nikko, and transported thence to the mine by two aerial trams, each about 19,500' in length, with some very long and high spans, these crossing the crest of the mountains and descending on the other side to Ashio. Power for the aerial trams is furnished by a water plant, with Pelton wheel, near Ashio. There also is a horse-tramway, connecting the different mines and smelters. Steam, water and electric power are used, there being 5 electric plants, developing about 2,500-h. p., generated mainly from adjacent streams. Much of the ore is handled underground by electric haulage plants, and power drills are used extensively. The mine equipment includes modern machinery, mainly of American and German manufacture.

The Ashio has a 25-stamp mill and 3 concentrators, ore being put about 4 into 1, and sent to the smelter with an average copper tenor of 15%. A little high-grade ore goes direct to the smelters. A 750-ton smelter, completed 1904, has 3 water-jacket blast-furnaces, two converter stands, with 7 shells, a 40-ton traveling crane, silica-mill, blowers, air-compressors, and all other devices found in any thoroughly modern copper smelting plant. The Ashio mine alone employs about 12,000 people, including the forces at the copper mines, flux quarries, smelters, charcoal kilns, offices, etc. The forces include men women and children, the children and females being employed at light labor only. Wages, while low according to western standards, are much higher than the average in Japan, miners earning 40c. to \$1 per day and smeltermen about 30c. per day, while engineers, carpenters, smiths and other craftsmen are paid 50c. to \$1 per day, and boys and girls in the mills earn 10c. to 25c. per day. Production of the Ashio, 1904, was 14,622,000 lbs. copper, of 99% tenor.

The Ani group, at Aniai, province of Ugo, is a group of very ancient mines, recently modernized in plant and mining practice. Shigeo Kasai is mine manager. The Ani mines have auriferous, argentiferous and plumbiferous sulphide

ores of copper, considerable silver values being secured as a by-product. The mine has steam, water and electric power, with a very good modern plant, including a 10-stamp mill and a 150-ton smelter. About 2,500 hands are employed and the production, 1904, was 2,264,000 lbs. of 97 % blister copper.

The Kusakura mine, at Rioshikaso, province of Echigo, opened in the Eighteenth Century, was bought by the Furukawa company in 1870. S. Gamoh is mine manager. This property shows 4 nearly parallel main veins, traversing porphyry and andesite, and averaging less than one foot in thickness, though occasionally widening to several feet. The upper workings show bornite and cuprite, with principal values in chalcopyrite, associated with galena and iron pyrites in the lower levels. The mine has steam and electric power and a small smelter, employing about 1,000 hands. Production, 1904, was 1,650,000 lbs. of 98.5% blister copper.

The Nagamatsu mine at Okura-mura, Mogami-gori, Uzen, shows many veins, largest ranging from 6" to 24" width. Ore is chalcopyrite, associated with pyrite and occasional sphalerite, in quartz gangue. Production, 1904, was 620,000 lbs. of 98% blister copper.

The Furokura mine, at Kazuno-gori, Rikuchu, was discovered 1762, opened 1765, idle 1794 to 1868, when again reopened. Has numerous veins carrying chalcopyrite associated with iron pyrites, hematite and occasional sphalerite and galena, with a clay gouge, traversing Tertiary strata and andesite. Production, 1904, was 550,000 lbs. of 97% blister copper.

The Mizusawa mine, at Iwasaki-mura, Waga-gori, Rikuchu, has two 3' veins at junction of granite and liparite, carrying chalcopyrite in quartz gangue. Production, 1904, was 296,000 lbs. of 97% blister copper.

The Kune mine, at Sakuma-mura, Iwati-gori, Totomi, was opened in 1726. The ore is chalcopyrite associated with iron pyrites, averaging 6% to 7% copper, occurring in three beds, the upper 100' thick, the middle 12' and the lowest 6' in thickness, the latter splitting into two 2' seams at the bottom. Production, 1898, was 137,686 lbs. fine copper.

The Otori mine made 187,000 lbs. fine copper in 1904.

The management of the Furukawa Mining Co. is not only one of the most progressive in Japan, but justly ranks with the most progressive engaged in the copper industry in any part of the globe. The responsible heads of departments are encouraged to travel through the mining and metallurgical centers of America and Europe, and as a result of the frequent visits of trained engineers, to all the leading mining centers of the world, the Furukawa company is enabled to keep fully abreast of international progress in every branch of its business. The enlightened policy followed by this company is one that might be followed, with decided advantage, by almost any great mine in any other country. Production, 1905, was 23,780,573 lbs. fine copper.

FUROKURA MINE.

JAPAN.

Owned by Furukawa Copper. Co.

FUTURITY MINING & MILLING CO.

COLORADO.

Letter returned unclaimed from former office, 370 Bennett Ave., Cripple Creek, Colo. Mine office: Newett, Chaffee Co., Colo. H. S. Smith, president,

Geo. L. Breithaupt, secretary and manager; Leo E. Breithaupt, superintendent. Has a 352' shaft, developing ores carrying gold, copper and silver. Has steam power.

COMPANÍA GADITANA DE MINAS.**SPAIN.**

Office: Cadiz, Spain. Mine office: Aznalcóllar, Sevilla, Spain. Capitalization, 3,000,000 pesetas, shares 500 pesetas par; debentures, 2,000,000 pesetas authorized. Marquis de Fiel Pérez Calixto, president; Don José Luis Lacave, treasurer; Don Salvador Viniegra, secretary. Property is La Caridad group of mines, carrying large bodies of cupriferous iron pyrites, with considerable development, and in order to furnish shipping facilities for its product, the company has built a railroad of 34 kilometres from Aznalcóllar to the Guadalquivir river. Management is excellent, and property is regarded as of considerable promise.

CAGNON MINE.**MONTANA.**

Owned by Trenton Mining & Development Co.

GALAHUE MINING & MILLING CO.**WASHINGTON.**

Office: care of Edward Peterson, managing agent, 705 First Ave., Seattle, Wash. Mine office: Cle Elum, Kittitas Co., Wash. Organized under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Lands, 10 claims, area 200 acres, showing copper ledge, also a vein of cinnabar of about 1% only in tenor. Development is by a 70' shaft on the Copper King claim, and by tunnels of 380' on the Last Chance, 310' on the Copper Prince, 123' on the Navidad and 120' on the Dolphin. Company claims a 3' vein of bornite in the Legal Tender, a 4' vein on the Last Chance, and a 3' vein on the Copper King. About \$15,000 has been expended on development.

GALENA COPPER MINING CO.**WASHINGTON.**

Office: 115 Marion St., Seattle, Wash. L. E. Rader, president; H. M. Williams, vice-president; John M. Snook, secretary; F. X. Waldron, treasurer; F. L. Horning, auditor; Judson C. Hubbard, manager. Organized 1904, under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Lands, presumably in the Silver Creek district of Snohomish county, Washington, are claimed to have given ores assaying 18.5% copper, 2.9 oz. silver and \$4 gold per ton. Development is claimed to be by tunnel, and management is said to be good.

GALENA MINE.**BRITISH COLUMBIA.**

Mine office: Britannia Beach, B. C. J. H. Scott, manager. Lands, sundry claims on Howe Sound, about 6 miles south of the Britannia mine, located one-half mile from tidewater, opened by a 100' tunnel on a 5' vein of copper ore.

GALENA MINE.**MONTANA.**

Mine office: Norris, Madison Co., Mont. D. A. Clapp, manager, at last accounts. Ores carry gold, silver and copper. Presumably idle.

GALENA RIDGE MINING CO.**WYOMING.**

Mine office: Meteetse, Big Horn Co., Wyo. Lands, circa 1,200 acres, patented, also timber lands and water-rights. Property has five veins of good width, on one of which the 450' Oregon tunnel shows ores carrying copper, lead, silver and gold values, with quartz gangue. Small sample shipments to Denver are said to have given good returns. Development is by a 1,400' cross-

cut tunnel, planned to be driven about 5,000'. Has a Pelton water-wheel and 10-drill air-compressor.

GALIZURSKI WORKS.

RUSSIA.

Located in the government of Elizabethpol, Russia. S. Varavov, owner. Production, 1899, was 1,390,095 lbs. fine copper.

GALLATIN COPPER BASIN COPPER MINING CO.

MONTANA.

Organized January, 1906, under laws of Montana, with capitalization \$100,000, to engage in mining in Gallatin county, Montana.

GALLATIN MINE.

MONTANA.

Owned by Anaconda Copper Mining Co.

GAP MINE.

PENNSYLVANIA

An old and idle property, in Lancaster county, Pennsylvania, which, until closed, 1903, was the principal American producer of nickel, making some copper as a by-product.

GARDINER, WORTHEN & GOSS CO.

ARIZONA.

Office and works: Tucson, Pima Co., Ariz. B. L. Worthen, general manager. Has a smelter with 30-ton experimental water-jacket blast-furnace, burning crude California petroleum, tests of which are said to have been satisfactory. Presumably idle.

GARDNER HILL MINE.

NORTH CAROLINA.

An old and idle mine at Jamestown, Guilford county, North Carolina, opened by a 110' shaft, showing cupriferous iron pyrites in 3 veins, ranging from a few inches to 3' in width.

COMPAÑIA MINERA GARDUNA y ANEXAS.

MEXICO.

Mine office: Placeres del Oro, via Cayuca de Catalán, Guerrero, Mex. Was worked originally for gold, but now has copper, and plans building a small matting furnace.

GARFIELD MINING CO.

UTAH.

Letter returned unclaimed from former mine office, Brigham, Utah.

GARLOCK MINE.

CALIFORNIA.

Mine office: Garlock, Kern Co., Cal. E. T. Garlock, superintendent. Has steam power and a 10-stamp mill. Presumably idle.

GARRISON GOLD & COPPER MINING CO.

UTAH.

Dead. Lands were near Ibapah, Tooe county, Utah.

GAVILANES MINING & MILLING CO.

MEXICO.

Office: 819 Chamber of Commerce, Chicago, Ills. Mine office: Gavilanes. Durango, Mex. C. A. Wightman, president; John A. Boland, secretary and treasurer; James E. Boland, manager. Organized Sept. 1, 1904, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 500 acres of mineral territory and 30,000 acres of timber and grazing lands, also water-rights to 10 miles of the Piaxtla and Pilar rivers. Lands, include the old Gavilanes silver mine, a property that has produced, according to official records, 80,000,000 ounces of silver, also sundry undeveloped copper veins.

GEIGER MINE.

COLORADO

Mine office: Apex, Gilpin Co., Colo. Ores carry gold, silver, lead and copper. Has steam power.

SUCESION FRANCISCO GEISSE.

CHILE.

Office and mines: El Espino, Combarbalá, Chile. Operates El Espino mine, opened 1896, making about 100,000 lbs. fine copper yearly.

GEISSE HERMANOS.

CHILE.

Office and mine: Illapel, Coquimbo, Chile. Operate copper mines, opened 1875, making a circa 300,000 lbs. fine copper yearly.

ALFRED W. GEIST.

MEXICO.

Office: Guadalajara, Jalisco, Mex. Mine office: Cuale, Jalisco, Mex. Lands, 5 miles from Cuale, include El Creator and El Favor mines, showing large ore bodies, extensively opened by antigua and modern workings. Ores are argentiferous and auriferous sulphides of copper, lead, zinc and iron. Property has water power. Reduction plant includes roasting furnaces, crushing machinery and an extensive patio.

LUIS L. GELABERT y CA.

PERÚ.

Office and mine: Otoco, Lucañas, Perú. Firm is a small producer of gold, silver and copper ores.

GEM TURQUOISE & COPPER CO.

NEW MEXICO.

Office: 37 Maiden Lane, New York. Mine office: Silver City, Grant Co., N. M. Property is a turquoise mine, in the Burro Mountains.

GEMINI MINING CO.

UTAH.

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John Q. Packard, president; E. W. Packard, vice-president; J. E. Berkeley, secretary; L. S. Hills, treasurer; Jackson C. McChrystal, general superintendent. Mine shows a 20' vein of argentiferous and auriferous copper ore, assaying 3% copper, on the 1,600' level. Has steam and water power, with a good mining plant. Is a small but steady producer of gold, silver and copper, and has paid dividends of \$300,000.

GENERAL DEVELOPMENT CO.

MONTANA.

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Adolph Lewisohn, president; J. H. Susmann, secretary and treasurer; J. Parke Channing, consulting engineer. Is controlled by the Lewisohn interests. Organized 1906, under laws of Delaware, with capitalization \$250,000, shares \$100 par; \$25 paid in. Was organized for the purpose of purchasing and developing promising mining properties. Present holdings include the Altoona group, in the eastern part of Butte, held under a \$100,000 bond, on which unwatering and reopening was begun early in 1906. Principal development is by an old 400' shaft, on the Amazon claim.

GENERAL ELECTRIC MINE.

ARIZONA.

Mine office: Clifton, Graham Co., Ariz. Idle at last accounts.

GENERAL GRANT MINING CO.

COLORADO.

Letter returned unclaimed from former mine office, Pemberton, Colo.

GEORGE THIRD MINING, MILLING & SMELTING CO.

COLORADO.

Letter returned unclaimed from former mine office, Carson, Colo.

GEORGETOWN GOLD MINING CO.

COLORADO.

Mine office: Georgetown, Clear Creek Co., Colo. Frank B. Branham, superintendent. Ores carry gold, silver, lead and copper.

GEORGIA & TENNESSEE COPPER CO.**GEORGIA & FLORIDA.**

Office: care of H. G. Brooks, 35 Congress St., Boston, Mass. Mine office: Temple, Haralson Co., Ga. Employs 6 to 10 men. Theo. Sutro, president; Otis Kimball, vice-president; Wm. Tudor, treasurer; preceding officers, L. V. Briggs and Jefferson Coolidge, Jr., directors; H. M. Mansfield, superintendent. Organized January 24, 1905, as successor of the Tallapoosa Copper Mines and Georgia Pyrites Co., with capitalization \$1,000,000, shares \$5 par. Annual meeting, second Tuesday in January. Lands, 447 acres of copper lands, in Georgia, and 800 acres of phosphate lands, in Marion and Levy counties, Florida, latter estimated to carry 800,000 tons of phosphate. Copper lands show country rocks of Laurentian schists, with 2 contact veins of 4' to 19' width, between slate and sandstone, opened by a 300' shaft. Has 1,250' of workings, estimated to show 85,000 tons of ore, with 45,000 tons blocked out for stoping, giving average assays of 3% copper, 2.7 oz. silver and \$2 gold per ton. Ore is chalcopyrite, disseminated in pyrites, with an average sulphur content of 41%. Company plans installing an acid plant and manufacturing superphosphate for fertilizer.

COMPAGNIE DES MINES DE CUIVRE ET**SPAIN.****DE PLOMB DE GERONA.**

French incorporation of Gerona Copper & Lead Mines, Ltd.

GERONA COPPER CO., LTD.**SPAIN.**

Voluntarily wound up, February, 1903.

GERONA COPPER & LEAD MINES, LTD.**SPAIN.**

Offices: 19, Queen Victoria St., London, E. C., Eng. Letter returned unclaimed from former mine office, Susquead, Gerona, Spain. Cecil A. Escott, chairman; Albert H. Greenhill, secretary. Organized, August 1, 1900, with capitalization £80,000, shares £5 par; issued, £50,050. Lands, 17 copper and lead mines, bought for £50,000 in shares. Idle for some years, and apparently moribund.

GERONIMO COPPER MINING CO.**NEW MEXICO.**

Letter returned unclaimed from alleged mine office, Silver City, Grant Co., N. M., with notation by the postmaster that the whole thing is a fake. Company apparently was promoted by the Financial Security & Trust Co., with supposed capitalization of \$1,500,000, shares \$1 par. Alleged property was claimed to be old mines, circa 8 miles, northwest of Silver City.

GERTRUDE MINE.**ONTARIO.**

Owned by Lake Superior Power Co.

GERTRUDE MINING CO.**WYOMING.**

Succeeded by Eagle Copper Co.

GEYMAN MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Lands are a small tract northeast of the Parrot smelter, on which a shallow shaft has been sunk.

GIANT CHIEF MINING CO.**UTAH.**

Lands, in the Bingham district, are said to have been sold, circa April, 1906, to Willard F. Snyder, et al.

GIANT GOLD & COPPER MINING CO.

Letter returned unclaimed from former office, La Crosse, Wis.

GIANT LEDGE GOLD & COPPER CO.**COLORADO.**

Office: 500 Frost Bldg., Los Angeles, Cal. Mine office: Manvel, San Bernardino Co., Cal. L. M. Gregory, president and general manager; H. G. Stoddard, secretary; R. W. Kenny, treasurer; Edward Brough, mine superintendent. Organized July, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 30 claims, also a 40-acre millsite and miscellaneous lands, with total area of upwards of 800 acres, in the New York district, showing 4 veins, of which 2 are being developed, one being a fissure in granite, and the other a contact vein between limestone and granite, with average width of 100', giving average assays of 5% copper, 5% lead, 10 oz. silver and circa \$4.50 gold per ton, from carbonate and oxide ores near surface and sulphides at depth. Has one shallow shaft and 2 tunnels, with about 4,000' of underground workings, developing a considerable amount of ore. Management plans shipping ore to the new custom smelter at Needles. Company has no debts, and is developing conservatively. Management and property considered good.

GIANT MINING CO.**BRITISH COLUMBIA.**

Mine office: Rossland, Trail division, Yale district, B. C. Ores carry gold and copper. Has steam power. Idle.

COMPAÑIA MINERA LA GIBOSA y ANEXAS.**MEXICO.**

Dead. Property now held by American Smelters Securities Co.

GIBRALTAR COPPER MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Wm. L. Sill, president; Chas. E. Winter, secretary. Has a 4' vein, opened by a 75' shaft, showing ore giving assays up to 20% copper, with good gold and silver values. Has steam power. Presumably idle.

GIBSON COPPER CO.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Employs 60 men. S. L. Gibson, president, treasurer and general manager; Wm. Henderson, vice-president; Delos Copeland, secretary. Organized 1906, under laws of Arizona, with capitalization \$2,500,000, shares \$25 par; issued, \$2,000,000.

Lands are 19 claims, area 380 acres, 5 surveyed for patents, circa 15 miles from Globe. Country rock is Pinal schists, with occasional trachyte, diorite, quartzite and porphyry, showing 20 or more veins or lenses, occurring as fissure veins in schists, and as contact veins between schists and porphyry. Main vein ranges 4' to 7' in width, and has been traced 2 miles. Development by shafts of 80', 120' and 285', and by tunnels of 120', 578', 650', 680' and 730', giving a total of about one mile of workings, estimated to put 125,000 tons of ore in sight, with 75,000 tons blocked out for stoping. Ores are exclusively sulphide, and are almost entirely bornite and chalcopyrite, of extremely high grade, running 20% to 40% copper. Ore occurs massive and frequently is coated with chalcocite. Main shaft shows bornite on the 100' level, and is bottomed, at 285', in massive chalcopyrite. It is planned to deepen the main working shaft to 700', and drift therefrom. Has 2 hoists, good for 500' depth each,

and is installing a new mining plant, including a 280-h. p. boiler, 60-h. p. engine, air-compressor, pump, power drills, etc. It is planned also to sink the second shaft to a depth of 500'. Fuel used is distillate and wood. Production, from May 1, 1904, to May 1, 1906, was \$253,194.43, from ore averaging 20% in tenor, shipped by teams to the Old Dominion smelter.

The Gibson is a property of great promise, and has accomplished what rarely is done by a copper mine. Its owners begun work with a cash capital of \$90, and on that foundation have built up a magnificent property, and from the net earnings of the mine have drawn out fully \$75,000 in cash for other investments. Management is good, and the property will be heard from prominently in the future.

GILA MONSTER COPPER CO.

ARIZONA.

Mine office: Kelvin, Pinal Co., Ariz. Thos. Rutledge and E. P. Grindell, superintendents, at last accounts. Lands include the Confidence mine, with circa 1,000' of underground openings, showing auriferous and argentiferous bornite, chalcocite and sundry oxidized ores. Property is considered promising. Idle.

GILA PINAL MINES CO.

ARIZONA.

Promoter dead and company probably ditto.

GILA VALLEY COPPER CO.

ARIZONA.

Mine office: Safford, Graham Co., Ariz. Floyd H. Wilson, president; J. F. Webber, manager. Organized 1905, as successor to the Federal Mining Co., name being changed back to the old title, and former officers put in the penitentiary, to remove the stench of the Qualey management. Lands, 24 claims, area 470 acres, also a 5-acre millsite, including the San Juan and Great Eastern groups, in the Lone Star district, Gila Mountains, showing three ore bodies, of about 9' average width, carrying oxide and carbonate ores above and sulphide ores below the 300' level. Mine is opened by shafts of 130', 325' and 425', and by tunnels of 90', 100' and 300'. Three shipments of ore, aggregating 75 tons, gave smelter returns of 24%, 28% and 30% copper, with about 2 oz. silver and 80c. gold per ton. Early in 1906 was erecting a 50-ton concentrator.

GILBERT & NORRIS.

MEXICO.

Mine office: Zacatecas, Zac., Mex. Mine is opened by shaft and tunnels and has gasoline power. Employed 40 men at last accounts.

GILCHRIST & DAWSON, INC.

NEW MEXICO.

Mine office: Fierro, Grant Co., N. M. J. D. Gilchrist, general manager. Company operates the Iron Head and Republic mines, producing mainly iron ore, with a little copper ore. Has steam power.

GILES GOLD MINING & MILLING CO.

COLORADO.

Mine office: Ward, Boulder Co., Colo. H. F. Llewellyn, superintendent. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill.

GILNOR BELLE MINE.

ALASKA.

A property of considerable promise, in the Copper River district of Alaska, about 170 miles inland from Valdez. At last accounts was said to be under bond to George Mitchell.

GYPSY BLAIR MINING CO.

Lands sold, 1905, to Kennebec Mining Co.

GIRARD MINE.

Sold, 1905, to Keweenaw Copper Co.

GIRILAMBONE COPPER MINING CO., LTD.

Succeeded by Girilambone Mining Co. (No liability.)

GIRILAMBONE MINING CO. (NO LIABILITY.)

Office: Sydney, N. S. W., Australia. Mine office: Girilambone, Cambelego Co., N. S. W., Australia. G. A. Richards, manager; W. Blakemore, mine manager. Employs circa 200 men. Ores are slightly argentiferous oxides, carbonates and sulphides, in a gangue of arenaceous slates, with numerous quartz veins and inclusions. Ores occur as disseminations and replacements, lacking the defined limits of ordinary fissure veins, in slate and sandstone country rocks having occasional hard bands of quartzite. Alteration zone extends down about 200'. Deepest shaft, 520'. Ores are divided into three classes for treatment, the first class comprising carbonates (including cuprite), with average assay value of 4.6%. Oxides from the transition zone make the second grade, and sulphides from the lower workings constitute the third class, each being smelted separately. Reduction is greatly hampered by deficiency of ore in sulphur and iron, and excess of silica. Water supply is very scant, causing trouble in times of drought. Mine has a dam and is compelled to filter and re-use the water repeatedly. Has a 250-ton smelter, with 5 reverberatory furnaces and one refining furnace, product being turned out as blister copper of the remarkable purity of 99.95%. The reduction plant includes a lixiviation plant, for leaching certain classes of oxide and carbonate ores.

GIROUX CONSOLIDATED MINES CO.**NEVADA & MEXICO.**

Office: 42 Broadway, New York. Mine offices: Ely, White Pine Co., Nev., and Carbo, Ures, Sonora, Mex. Joseph L. Giroux, president; Eugene L. Giroux, vice-president; G. E. Giroux, secretary; J. C. Kennedy, treasurer; J. A. Snedaker, consulting engineer; Lorren M. Hart, counsel; preceding officers, Conrad Dietz, Guy E. Giroux and Josiah Marvel, directors; Wm. R. Bassett, business manager; Gideon L. Giroux, superintendent. Employs circa 300 men, of whom 225 are at the Mexican mines. Organized under laws of Delaware, with capitalization \$5,000,000, shares \$5 par.

Lands are 1,287 acres, in two groups, one group, of 96 pertenencias, area 237 acres, being in the Ures district of Sonora, Mexico, and one group, area 1,050 acres, lying in the Ely district of Nevada. The Mexican claims, including the San José and Sultana mines, and commonly known as the Sultana group, lie in the Sierra de Oro Mountains, about 25 miles east of Carbo and circa 35 miles from Hermosillo. This property shows a lime-porphry contact vein of 50' to 100' width, opened by 3 shafts, with about one mile of underground workings. Sultana No. 1 shaft is 200' deep; Sultana No. 2, the main working shaft, sunk on an incline, is 1,075' deep, and San José shaft is circa 500' deep, and bottomed in a 40' vein with considerable ore blocked out. The Sultana group as a whole shows ores of 3% to 4% in copper

UTAH.**MICHIGAN.****AUSTRALIA.****AUSTRALIA.**

tenor, with variable gold values, latter ranging from very small to very large, with a good proportion of high-grade ore. Smelter shipments of Sultana ore to El Paso have given combined gold and silver values ranging from 92 cents to \$734.36 per ton, and Sultana shipments of April, 1906, amounting to 472 tons, returned \$92,151 in values, giving an average gross return of \$194.41 per ton.

The Nevada properties are the more important, and are of considerable promise. These lands lie immediately west of the Nevada Consolidated. The first series of ore measures are on the contact between plutonic and sedimentary rocks, the latter showing enormous areas of replacement by ore, with gangue of quartz, talc and clay. In places this series has been proven to a width of upwards of 1,000', but the entire formation is not profitable. Measures of 100' and upwards in width, of fair ore, have been opened.

The second series of ore measures is in the Giroux shaft, immediately above water-level, constituting a horizontal bed of oxidized ores of 30' to 40' thickness, said to average 7% or better in copper tenor.

The third series consists of a quartz-porphyry, which is a highly altered acid andesite, carrying upwards of 60% silica. The exposed surface has been leached to some extent, but at depths of 30' to 40', and below, to the depths yet tested, this porphyritic ore body, which in some respects is similar to that of the Bingham camp of Utah, carries ore values said to average 4% copper, in chalcocite, melanconite, and, at depth, chalcopyrite. The third series is in the plutonic area, which is estimated at 1,500x2,400' on the Giroux property, with evidence leading to the opinion that the limits of the is mineralization, as now defined, may be considerably extended by further investigation.

Through this ground-mass of quartz-porphyry there are fissure veins varying from 3' to 20' in width, carrying ores claimed to average about 12% copper, 1 oz. silver and \$6 gold per ton. These veins, or seams, show evidence of small faulting, and the ore deposits therein evidently are from mineral-bearing solutions coursing along the lines of least resistance. The quartz-porphyry, while lower in grade than the other occurrences of ore, contains infinitely so much more material that it must form the principal source of ore supply eventually. The ore is of a comparatively friable nature, and seems to present no unusual or complex problems in concentration. The vast extent of the ore body, and its occurrence in an immense mass, naturally have caused the management to give consideration to the methods to be followed in mining. While the present developments are on fissure veins, and these will be the first to produce, eventually the quartz-porphyry must be attacked, and it is probable that the plan of winning the ore will be a modification of the steam-shovel method, used so extensively at the iron ore mines of the Mesaba range, in the Lake Superior district.

Present mining development at the Ely mines is by shafts, of which there are eleven. The six principal working shafts have two compartments each, and are as follows: Giroux shaft, 800': Alpha shaft, 650': Taylor, Bunker Hill, Pilot Knob and Brooks shafts, 300' each, at last accounts. It

is planned to sink the Giroux and Alpha shafts to 1,000' depth each, as soon as practicable. The mines have about two miles of underground workings, and show some fair stopes. The leached zone, at and near surface, is followed by a zone of secondary enrichment, reaching to a depth of circa 375', below which are unaltered sulphides. The zone of secondary enrichment shows considerable native copper, in addition to the usual oxides, carbonates and enriched sulphides. The 300' level of the Giroux shaft shows a large ore body, claiming to range 7% to 15% in average copper tenor, and the average of the entire mine, as opened, is claimed to be better than 5% copper. Equipment is simple, but sufficient for development purposes, including 4 hoists, air-compressors, and necessary shops and mine structures.

A concentrator, rated at 500 tons daily capacity, is being built, and installation of machinery should begin during the latter half of 1906.

A contract has been let to the Colorado Iron Works Co. for a complete 250-ton smelter for the Nevada mines. The plant will include a 42x180" water-jacket blast-furnace, blower, air-compressor, converter with one stand and 3 shells, etc., entire plant costing about \$125,000. This was contracted for completion July 15th, 1905, but was not completed in May, 1906, and probably will not go into blast until the arrival of a railroad at Ely. The pressure from impatient shareholders always is very great in the case of a new mine, upon which large sums have been expended, but the conservative policy is the proper one in such a case, and many a good mine has been seriously handicapped by beginning production under disadvantageous circumstances.

In the two past editions of the Copper Handbook the Giroux company was censured for misleading statements put forth in its behalf, but it was stated that Mr. Joseph L. Giroux is a mining man of high standing, and the property was considered promising. It is with pleasure that the Copper Handbook is able to state, in its present edition, that a more conservative policy has been adopted.

GLADHAUGH MINE.

ALASKA.

Mine office: Ellamar, Alaska. Property, on Prince William Sound, is opened to a depth of circa 500', and some ore, giving returns up to 10% copper, has been shipped.

GLADSTONE MINE.

ARIZONA.

Was held, at last accounts, by Ideal Mining & Development Co.

GLADYS MINING CO.

BRITISH COLUMBIA.

Mine office: Alberni, Vancouver Isld., B. C. Property is opposite the Monitor mine, and across the Alberni Canal therefrom, and apparently has the extension of the Monitor vein, showing high-grade chalcopryrite.

GLASDIR COPPER MINES, LTD.

WALES.

Voluntarily liquidated, October, 1903.

GLASDIR COPPER MINES (1903), LTD.

WALES.

Offices: 4, Broad Street Place, London, E. C., Eng. Organized Oct. 17, 1903, with capitalization £1,000, shares £1 par, apparently as a tentative reorganization of the Gladsir Copper Mines, Ltd.

GLASGOW COPPER SYNDICATE, LTD.**CALIFORNIA.**

Offices: 149, St. Vincent Street, Glasgow, Scotland. T. & G. B. McKim & Cook, secretaries. Organized Dec. 14, 1904, with capitalization £8,000, shares £1 par, to acquire copper property in Fresno county, California.

GLASGOW & WESTERN EXPLORATION CO., LTD.**NEVADA.**

Offices: 33, Renfield St., Glasgow, Scotland, and 317 McCormick Bldg., Salt Lake City, Utah. Geo. McFarlane Reid, chairman; Otto Stallman, general manager; Jos. Farren, superintendent; George Cuthbert, secretary. Organized Oct. 28, 1896, with capitalization £30,000, shares £1 par. Manages and is the principal owner of the Adelaide Star Mines, Ltd.

GLEN-JENNINGS COPPER MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Idle.

GLOBE & ARIZONA DEVELOPMENT CO.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. T. A. Pascoe, president; J. H. Hamill, vice-president; Chas. T. Martin, secretary; Chas. F. Solomon, treasurer; Pat Rose, superintendent. Capitalization \$600,000, shares \$10 par. Lands are sundry well located claims, adjoining the United Globe and Arizona Commercial Copper Co. Development is by a 65' shaft, showing a 2' vein of 12% ore, and a 180' tunnel showing 16% ore.

GLOBE-BOSTON COPPER MINING CO.**ARIZONA.**

Lands sold, circa 1906, to Globe Consolidated Copper Co.

GLOBE CONSOLIDATED COPPER CO.**ARIZONA.**

Office: care of Henry B. Hovland, Duluth, Minn. Organized June, 1906, with capitalization \$1,500,000, shares \$10 par: issued, \$1,000,000, \$5 paid in. Lands are about 150 claims, area circa 3,000 acres, including the Globe-Boston property, a group of 21 claims near the Old Dominion and United Globe mines, bought for \$130,000, the Mallory group, and other extensive holdings. The Globe-Boston property has considerable development, having a 465' two-compartment shaft, showing a 4' vein of low-grade chalcopryite, with occasional bunches of bornite, both carrying fair silver values. Property is extensive, and the major portion of the holdings is excellently located. Management, which includes Messrs. Henry B. Hovland and Hoval A. Smith, who have been closely connected with the Calumet & Arizona group, since its inception, is good, and the property is considered one of much promise.

GLOBE COPPER MINING CO.**ARIZONA.**

Dead. Property now owned by Old Dominion Mining & Smelting Co.

GLOBE COPPER MINING CO.**WYOMING.**

Office: 24 Giddings Blk., Colorado Springs, Colo. Mine office: Hecla, Laramie Co., Wyo. A. C. Widdicombe, president; J. A. Morrison, vice-president and general manager; John H. House, secretary; Stewart Davis, treasurer; Prof. H. C. Beeler, consulting engineer. Organized 1901, under laws of Colorado, with capitalization \$1,500,000, shares \$1 par. Lands, 22 claims, area 438 acres, in the Silver Crown district, showing sundry fissure veins, of which 3, of 7' average width, are opened by 5 shafts.

of 100' average depth, and by tunnels of 90' and 160', giving estimated average values of 12% copper, 6 oz. to 10 oz. silver and \$5 gold per ton, from sulphide ores. Has steam power and an air-compressor. Idle for several years.

GLOBE MINE.**MICHIGAN.**

Office: care of Copper Range Consolidated Co., 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. F. W. Denton, superintendent. Property is owned by the estate of John Stanton, and is held under an option, expiring April, 1907, by the Copper Range Consolidated Co., which has paid \$50,000 thereon, and it is understood that the option calls for the payment of 10,000 shares of new stock of Copper Range Consolidated, if the property is taken over. Property is Sections 1 and 2, Town 53 North, Range 35 West, carrying about 6,000' of the strike of the Baltic lode, and adjoining parallel amygdaloid beds. The Champion mine lies next to the north, and the Challenge mine next to the south. The Copper Range company expended \$54,000 in development work, to the end of 1905.

Diamond drill borings having shown ores carrying good copper values, it was decided to sink a shaft and open the mine. The overburden of sand and boulders is one of the heaviest in the Lake Superior district, hence it is necessary to reach the solid rock ledge by a vertical shaft, through an overburden about 250' in thickness. Much trouble has been experienced in sinking the preliminary sand-shaft, and the system of sinking has been modified frequently, and changed radically from the plan on which started. The shaft, about 700' south of the Champion boundary line, was about 150' deep on May 1, 1906. The shaft is being sunk on a telescopic plan, the inside measurement of timbers, at the collar of the shaft, being 13' 3" x 23' 3", with inside measurement of the second section 9' x 19' 6", and a third section will be still smaller. This plan will permit new inside timbering, and whatever realignment is required, when the shaft is bottomed. The shaft is being sunk with 64 steel shoes, each built with a water-jet having an opening of one square inch, and a water pressure of 300 pounds per inch. Weight of shoes is 37,000 pounds and these are pressed down by 6 hydraulic jacks, each exerting a pressure of 100 tons. The shaft is wet, making 800 gallons of water per minute, and progress is very slow.

The south drifts of the Champion mine, not far from the Globe boundary, are breasted in excellent rock, and there is every reason to anticipate the making of a fine mine from the Globe, but the preliminary work of reaching the solid rock ledge is certain to be tedious and costly, this being one of the deepest sand-shaft ever sunk.

GLOBE MINING CO.**ARIZONA.**

Office: 506-171 Washington St., Chicago, Ills. Mine office: Globe, Gila Co., Ariz. J. F. Hechtman, president and general manager; M. A. Patterson, vice-president; Geo. L. Beach, treasurer; Walter M. DeKalb, secretary. Organized February 19, 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands 27 claims, area 540 acres, including gold, silver and copper groups, nearest lying about 2½ miles from

Globe. Country rocks are granite-porphry, syenite, quartzite and diorite, showing sundry fissure veins in diorite, running 2' to 100' in width, with iron cappings, giving assays of 2% to 6% copper, 4 oz. to 30 oz. silver and \$2 to \$28 gold per ton. The Mineral Farm group, of 18 full and 3 fractional claims, includes the Vacey-Constance mine, worked circa 1886, for silver, and having a 165' shaft. The Mineral Farm group shows altered sedimentary and igneous rocks, with iron dikes and a complex fissure system. The Mineral Farm vein, of about 4' width, gives assays of 4.8% copper and up to 132 oz. silver and \$7.44 gold per ton. This property also shows a 20' vein sampling 22% copper, 9% zinc, 2 oz. silver and \$4.96 gold per ton. The group is said to have produced \$100,000 in silver, under a former management. Miscellaneous holdings includes the Eagle Pass group. Property is considered promising.

GLOBE & PINTO MINING CO.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. A. T. Hammons, secretary. Organized circa 1905. Lands, 11 claims, lying north of and adjoining the Five Points group, opened by a 50' shaft, claimed to show several thousand tons of ore, assaying 4% to 12% copper.

GLOBE TRACT.

Office: care of Estate of John Stanton, owner, 15 William St., New York. Property is Sections 3, 4, and 5, Town 53 North, Range 35 West, Houghton county, Michigan. From the original Globe tract the Globe mine, area 1,280 acres, has been set off, and is under option to the Copper Range Consolidated Co.

GLOBE WESTERN COPPER CO.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. L. G. Stewart, president and general manager; J. Weinberger, secretary. capitalization, \$2,000,000, shares, \$10 par. Lands include the Stewart & Clark group, near the Gibson mine, and the Cole & Goodwin group. The Stewart & Clark group is developed by a 250' shaft, bottomed in high-grade sulphide ore, assaying 10% to 15% copper and upwards of 30% each in iron and sulphur. Shipments were begun to the Old Dominion smelter, April 19, 1906. Property is considered promising.

GEWERKSCHAFT VER. GLÜCKAUF-NEVIGES.

GERMANY.

Mine office: Neviges, Rheinprovinz, Germany. Has lead and copper ores, developed by two shafts, and employed about 100 men, producing circa 12,000 tons of ore yearly, at last accounts.

GEWERKSCHAFT GLÜCKSBRUNN.

GERMANY.

Merged, 1903, in the Eisfelder Kupfergewerkschaft.

GOAT CREEK MINING CO.

WASHINGTON.

Mine office: Methow, Okanogan Co., Wash. John R. Cassin, manager, at last accounts. Ores carry gold, silver and copper.

GODIVA MINING CO.

UTAH.

Mine office: Eureka, Juab Co., Utah. J. H. McChrystal, superintendent. Ores carry gold, silver and copper. Has steam power. Presumably idle.

A. GOERZ & CO., LTD.**GERMAN SOUTHWEST AFRICA.**

Offices: 20; Bishopsgate St., Within, London, E. C., Eng.; 26, Rue Lafayette, Paris, France; 8, Behrenstrasse, Berlin, W., Germany, and 4, Fraser St., Johannesburg, Transvaal, South Africa. Lord Battersea, chairman; Amandus Brakhan, Johannesburg, chairman and joint managing director; Henry Strakosch, London, managing director; Henry Clark, secretary, London. Has extensive holdings in the Witwatersrand gold fields, also exclusive prospecting rights over 6,500 square miles in German Southwest Africa. Construction of a railroad line from the sea to Swakopmund is planned. Copper ores have been discovered at a number of points, in the district controlled by this company.

GOLD ANCHOR MINING CO.**COLORADO.**

Mine office: Alice, Clear Creek Co., Colo. Thos. I. Slater, manager. Ores carry gold, silver and copper. Has gasoline power.

GOLD BELT MINING CO.**MONTANA.**

Mine office: Empire, Lewis & Clark Co., Mont. Owen Byrnes, superintendent. Property includes the Empire and other mines, carrying gold, silver, lead and copper ores. Has steam power, 60-stamp mill and 500-ton cyanide plant, employing about 50 men, at last accounts.

GOLD BUG CONSOLIDATED MINING CO.**WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. F. H. Merritt, superintendent, at last accounts. Ores carry gold, silver and copper.

GOLD BUG MINE.**COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. N. B. Clough, superintendent, at last accounts. Ores carry gold, silver and copper.

GOLD & COPPER COMPANY OF BINGHAM.**UTAH.**

Succeeded, 1901, by Bingham Consolidated Mining & Smelting Co.

GOLD & COPPER CONSOLIDATED MINING & MILLING CO. ARIZONA.

Office: 402-130 Dearborn St., Chicago, Ills. Letter returned unclaimed from former mine office, Groom Creek, Yavapai Co., Ariz. R. A. Sweet, president and treasurer; J. B. Pogue, secretary; A. J. Pickrell, general manager; J. Chidister, superintendent. Organized 1901, under laws of Arizona, with capitalization \$4,000,000, shares \$1 par. Lands, 35 claims, area 700 acres, including the Rockefeller, Chicago, President and Little Kid claims, in the Hassayampa and Big Bug districts, showing numerous fissure veins, carrying auriferous and argentiferous oxide, carbonate and sulphide ores of copper, with claimed average values of 7% copper, 46 oz. silver and \$38 gold per ton, and undetermined lead values. Has 34 pits and shafts, claimed to be of 10' to 815' depth, and 21 tunnels, claimed to be of 20' to 800' length, claimed to give about 2 miles of underground openings. Company claims to have 150,000 tons of ore blocked out for stoping. Has a steam power equipment, with hoists, shops, etc., also a 10-stamp mill, 50-ton cyanide plant, and 50-ton concentrator. Company claims to have been developing since 1904, and claimed, falsely, to be running the mill night and day—but kept on peddling stock. If the outfit be anything but a rotten

stock-jobbing scheme, the company should sue General Appearance for presenting the management in such an unfavorable light.

**GOLD & COPPER DEEP TUNNEL MINING
& MILLING CO.**

NEW MEXICO.

Office: care of A. Dom, secretary and treasurer, 780 E. Madison Ave., Cleveland, Ohio. Mine office: Elizabethtown, Colfax Co., N. M. Employs 6 men. A. T. McIntyre, president; John Pearson, vice-president; W. P. McIntyre, mine superintendent. Organized October, 1900, under laws of New Mexico, with capitalization \$2,000,000, shares \$1 par; issued, \$1,940,000. Annual meeting, second Tuesday in July.

Lands, 10 claims, area circa 100 acres, also a 2.5-acre millsite, on the western slope of Baldy Mountain, in the Moreno district, showing limestone, quartzite, slate and porphyry country rocks, with fissure and contact veins in and between quartzite and slate. Has 2 shallow shafts and a 1,900' crosscut tunnel, opening 2 large ore bodies of low-grade auriferous copper ore. Has gasoline power and electric drills, with a 20-ton stamp-mill of lumber and logs, size 40x80', equipped with a 5' Huntington mill and gravity stamps. Nearest railroad, 3 miles. Company plans continuing development steadily. Management and property are well regarded.

GOLD & COPPER FIELDS SYNDICATE, LTD.

AUSTRALIA.

Voluntarily liquidated, March, 1902.

GOLD-COPPER MINING CO.

ARIZONA.

Office: Prescott, Arizona. Col. E. Routman, general manager. Lands, in the Hassayampa district, include the Peacock, Mountain View and Iron Duke claims, opened by a 180' tunnel, cutting a vein carrying auriferous and argentiferous copper ore, that has given assay values of \$30 per ton.

GOLD-COPPER MINING CO.

CALIFORNIA.

Office: care of J. McCosh Smith, Rocklin, Cal. Mine office: Lincoln, Placer Co., Cal. Lands, 160 acres, slightly developed by shaft.

GOLD & COPPER MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Rociada, N. M.

GOLD-COPPER MINING & DEVELOPMENT CO.

SOUTH DAKOTA.

Letter returned unclaimed from former office, Deadwood, S. D.

GOLDEN COVE MINING CO.

NEW MEXICO

Mine office: Hachita, Grant Co., N. M. W. H. Hare, president; W. T. Stewart, vice-president; Fred. E. Emery, secretary and treasurer. Has several shafts of 10' to 85' depth, showing a vein said to give average assays of 18% copper and 20% lead, with gold and silver values.

GOLDEN EDGE MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Rambler, Carbon Co., Wyo. Lands were sundry claims, south of Rambler, showing copper ore.

GOLDEN GATE GROUP.

COLORADO.

An idle prospect, near the foot of Badger Mountain, Tarryall district, Park county, Colorado, said to show a vein of 10' to 30' width, giving assays of 12% to 62% copper, and \$10 and upwards gold per ton.

GOLDEN KEY MINE.**WASHINGTON.**

Letter returned unclaimed from former mine office, North Bend, Wash.

GOLDEN MINT MINES, LTD.**NORWAY.**

Voluntarily liquidated, October, 1903.

GOLDEN RULE COPPER MINING & SMELTING CO.**ARIZONA.**

A fraudulent mining company, formerly at 220 Broadway, New York, and having 17 claims, near Oracle, Pinal county, and Vail, Pima county, Arizona. Was promoted by one Wm. E. Lake, "a prominent church and Sunday school worker" of Yonkers, N. Y., who purchased sundry cheap holes in the ground in Arizona, at a cost of \$500, and thereupon organized a million-dollar company, keeping for himself all but the 7 shares required for dummy directors. He then pledged the company to pay him \$15,000, and generously donated 200,000 shares to the treasury. Purchasers thought they were obtaining treasury stock, and Christian friends invested \$125,000, of which only \$15,000 ever was accounted for. Assets of the company, at the time of the show-down, were a donkey hoist in Arizona, and a roll top desk in New York, the company having lost the hole in the ground on which it was incorporated originally. Moral: beware of stock-peddlers who mix piety with business.

GOLDEN STAR MINING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Doniphan, Idaho.

GOLDEN STATE MINES, LTD.**ARIZONA.**

Offices: 20, Lawrence Lane, London, E. C., Eng. C. F. Branton, director; G. Thompson, secretary. Organized June 25, 1897, as reconstruction of Geldfontein Estates & Gold Mining Co., Ltd., with capitalization £100,000, shares 5s. par; issued, £61,254. Lands, 120 acres, on Copper Creek, in the Dragoon Mountains, Cochise county, Arizona, supposed to have a small smelter. Idle for some years.

GOLD HILL COPPER CO.**NORTH CAROLINA.**

Office: 80 Broadway, New York. Mine office: Gold Hill, Rowan Co., N. C. W. G. Newman, president; Wm. M. Richardson, secretary and treasurer. Capitalization \$5,000,000. Lands, 1,050 acres, in Rowan and Stanley counties, North Carolina, well watered and timbered, including the Gold Hill mine, operated spasmodically since circa 1850, and which has secured a very considerable gold production. Mine has a 750' main shaft, and ore is said to average 2.75% to 3% copper, with good gold values. Property is served by the Southern Railroad, and the Yadkin river has 7,500-h. p. available, 17 miles from Gold Hill, and development of this power is now under way. Fuel is bituminous coal, costing \$2.25 per ton, delivered, and labor is \$1 per day. Present company worked on a considerable scale, 1901-1903, employing 250 men, but got into financial difficulties, ending, 1903, in the appointment of C. M. Miller as receiver. At last accounts, mine was being kept unwatered, and management hoped to arrange for resumption of work.

GOLD HILL QUARTZ MINING CO.**OREGON.**

Office: 111 Fifth Ave., New York. Mine office: Gold Hill, Jackson

Co., Ore. C. R. Ray, superintendent. Property includes the Braden, Conger and Elk Creek mines, ores of which carry gold, silver, lead and copper. Has steam power and a 10-stamp mill, employing circa 30 men, at last accounts.

GOLD KING CONSOLIDATED MINES CO.

COLORADO.

Office: Waterville, Me. Mine office: Silverton, San Juan Co., Colo. W. Z. Kinney, superintendent. Ores carry gold, silver and copper. Has steam, electric and gasoline power and an 80-stamp mill, producing mainly gold, with a little copper secured as a by-product.

GOLD MOUNTAIN MINING CO.

WASHINGTON.

Mine office: Berlin, King Co., Wash. F. Karl, superintendent, at last accounts. Has antimonial gold-copper ores, opened by tunnel, with water and electric power.

GOLDSMITH COPPER CO., LTD.

BRITISH COLUMBIA.

Presumably dead. Had lands on Howe Sound, British Columbia.

GOLD STAR MINING CO.

WASHINGTON.

Office: 2107 E. Madison St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Aden Fraser, president; John Edmond Praul, secretary, treasurer and general manager. Organized 1903, under laws of Washington, with capitalization \$1,000,000, shares, \$1 par; issued, \$500,000. Lands, 6 claims, area 120 acres, well timbered, in the Index district, showing a country rock of syenite, carrying a 6' vein giving assays of 7% copper and \$1.20 gold per ton, from bornite, and \$25 gold per ton from an oxidized quartz capping. Is 4 miles from the Great Northern Railway. Idle, but plans resumption of work during 1906.

GOLD TUNNEL & RAILWAY CO.

COLORADO.

Mine office: Silverton, San Juan Co., Colo. Wm. Cole, superintendent. Early in 1906 employed about 25 men, and was shipping 100 to 150 tons monthly of ore giving smelter returns up to \$100 per ton, in copper and silver.

GOLETA CONSOLIDATED MINES.

CALIFORNIA.

Mine office: Jordan, Mono Co., Cal. Hugh W. Nelson, superintendent, at last accounts. Property is a gold mine, equipped with a 40-stamp mill and cyanide plant, but has a 6' vein of chrysocolla, slightly developed.

GOLINSKY MINES.

CALIFORNIA.

Sold, 1904, to Mammoth Copper Mining Co.

SUCESION E. GONZALES.

MEXICO.

Office, mine and works: Guanajuato, Gto., Mex. Has a small smelter, known as the Salgado. Production, 1903, was 5,793 kgs. blister copper.

SUCESION P. GONZALEZ.

CHILE.

Office and mine: Labrar, Freirina, Atacama, Chile. Has a matting furnace and produces circa 1,250,000 lbs. fine copper yearly.

GOOD HOPE MINING & REDUCTION CO.

COLORADO.

Office: Del Norte, Colo. Mine office: Vulcan, Saguache Co., Colo. Louis Weiss, superintendent. Ores carry gold, silver and copper. Has steam power. Idle.

GOODLANDER MINING & MILLING CO.**MEXICO.**

Office: 603 New Ridge Bldg., Kansas City, Mo. Letter returned unclaimed from former mine office, Moctezuma, Sonora, Mex. Alfred Blaker, president; John W. Amerman, secretary; Geo. F. Woodward, general manager. Capitalization \$1,000,000. Ores carry gold, silver and copper. Mine is opened by shaft. Has steam-power and a 10-stamp mill. Idle and apparently moribund.

GOODRICH PROPRIETARY.**AUSTRALIA.**

Mine office: Yeoval, New South Wales, Australia. F. Pearce, manager. An old property, once a considerable producer of gold and copper, reopened, 1902, by a new 450' shaft, sunk to get beneath the former workings, which have been reached by a crosscut. Ore assays 18% copper and 4 oz. gold per ton, and occurs in a pipe-vein about 300' in diameter. Mine has given much trouble in the past, from caving, and requires very careful handling.

GOODSPRINGS SMELTING & DEVELOPMENT CO.**NEVADA.**

Office: Los Angeles, Cal. Works office: Goodsprings, Lincoln Co., Nev. A. H. Gates, president; Geo. W. Hinckley, vice-president; Warren W. Porter, secretary and treasurer; C. H. Raymond, assistant manager; preceding officers, W. E. Jeannot, R. S. Hardy and W. H. Wilson, directors. Contracts have been let for a 225-ton furnace, with other equipment for a 500-ton smelter. Company is laying out a townsite at Goodsprings, and plans installing water-works and electric light, and opening a general store, also building an electric belt-line reaching various adjacent mines, and a 7-mile railway spur from Goodsprings to Goodsprings Siding, on the Salt Lake railway. Contracts have been made with a number of mines in the vicinity, and company plans smelting auriferous and argentiferous copper and lead ores, and may install a zinc smelter later. Fuel will be coke from Utah and petroleum from Los Angeles, both available on the line of the Salt Lake railway.

GOOD VENTURE COPPER MINING CO.**NEW HAMPSHIRE.**

Letter returned unclaimed from former mine office, Woodville, N. H.

GOODVENTURE MINING & MILLING CO.**WYOMING.**

Presumably dead. Letters returned unclaimed from former office, Boston, Mass., and former mine office, Hecla, Laramie Co., Wyo.

GOTHIC MILLING, MINING & POWER CO.**COLORADO.**

Letter returned unclaimed from former office, Masonic Bldg., Peoria, Ill. Mine office: Crested Butte, Gunnison Co., Colo. James Donn, president; M. W. Jones, secretary; F. L. Clemens, general manager. Mine, opened by shaft and tunnel, shows ores carrying silver, lead and copper. Is claimed to have a 50-ton concentrator, and two 50-ton smelters.

BERGWERK GOTTLICHE HÜLFE STOLLN.**GERMANY.**

Mine office: Tannenbachstal bei Brunndöbra-Georgenthal, Saxony, Germany. Presumably idle.

GOULAIS BAY MINING CO.**ONTARIO.**

Lands, 1,300 acres, on Goulais Bay, Lake Superior, 26 miles north of

Sault Ste Marie, Algoma, Ontario, on which a little exploratory work was done, circa 1902. Capitalization, \$3,000,000. Idle and apparently moribund.
GOULD COPPER MINING CO.

ARIZONA.

Mine office: Tucson, Pima Co., Ariz. S. H. Gould, president; W. H. Dailey, secretary. Lands, 19 claims, in the Tucson Mountains, 15 miles west of Tucson, covering nearly one mile of the east and west strike of a mineral formation circa 2,000' wide and 5 miles long. Country rocks are limestone and quartzite, and ore is chalcopryite, with quartz gangue, averaging 3% to 4% copper, 3 oz. silver and \$1.50 gold per ton, with sufficient iron to be self-fluxing. Development is by shafts of 50', 125' and 375', and 2 tunnels. A two-compartment main shaft is said to show a 35' vein on the 100' level, and a 45' vein on the 200' level. Has a gasoline engine and air-compressor. Management seems good and property is considered promising.

GOULD MINING CO.**WYOMING.**

Mine office: Centennial, Albany Co., Wyo. Lands, sundry claims on the summit of Centennial Mountain, said to show ore assaying 30% copper and \$50 gold per ton. Presumably idle.

GRAFTER MINE.**YUKON.**

Office: Whitehorse, Yukon, Canada. Shipped 450 tons of high-grade ore to the Crofton smelter, circa 1903-1904. Property is considered promising, but is handicapped by the exorbitant transportation charges on its ore, and cannot be developed to the point of large and profitable production without the establishment of a local smelter, or securing living freight rates.

GRAHAM COUNTY MINING CO.**ARIZONA.**

Office: 1509-20 Broad St., New York. Mine office: Fort Grant, Graham Co., Ariz. John W. Manning, president; Schuyler S. Moore, secretary and treasurer; Prof. Geo. A. Treadwell, consulting engineer. Capitalization \$250,000, shares \$10 par. Lands, sundry gold-copper claims in the Clark district, on which the company claims to have expended upwards of \$100,000 in development work. Idle for several years, except for annual assessment work, but efforts are being made to effect a reorganization.

GRANBY CONSOLIDATED MINING,**BRITISH COLUMBIA.****SMELTING & POWER CO.**

Office: 52 Broadway, New York. Mine office: Phoenix, B. C. Works office: Grand Forks, B. C. Employs 850 men, of whom approximately 475 are at the mines and 375 at the smelter. Jacob Langeloth, president; Jay P. Graves, vice-president and general manager; preceding officers, Wm. H. Nichols, Berthold Hochschild, George Martin Luther, George Crawford Clark, Arthur C. James, Geo. F. Baker, Jr., Payne Whitney, Henry Lee Higginson, A. L. White, Sanford H. Steele, Geo. Crawford Clark, Jr., and Edwin Thorne, directors; Northrup Fowler, secretary; G. W. Wooster, treasurer; A. B. W. Hodges, general superintendent; O. B. Smith, Jr., mine superintendent; W. A. Williams, smelter superintendent; J. C. McDonald, master mechanic; C. E. Lane, electrician; Miles Barrett, smelter foreman; Philip Herr, converter foreman.

Organized March 1901, under special charter from the Province of British Columbia, with capitalization \$15,000,000, par changed, 1906, to \$100 per share, non-assessable and fully issued. Stock is listed on the Boston Stock Exchange. Has circa 2,000 shareholders of record. First dividend, of 1%, amounting to \$133,630.30 was paid Dec. 16, 1903. No dividends were paid 1904; paid one dividend of 3%, amounting to \$405,000, in 1905, and a third dividend of 3%, May 16, 1906. Fiscal year ends June 30. Annual meeting, first Tuesday in October. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., Boston, transfer agent.

Lands, 27 claims, area 790 acres, crown-granted, also 500 acres of mill and smelter sites and 800 acres miscellaneous lands, in the Osoyoos mining district, Boundary division, Yale district, British Columbia, very near the United States line. Mining properties included the Old Ironsides, Knob Hill, Victoria, Grey Eagle, Banner, Tip Top and Triangle claims, to which were added, by purchase, during 1904-1905, 13 other mines and claims, as follows: Gold Drop Group, area 4 claims, bought for \$225,000; No. 13 claim, bought for \$12,000; Monarch & Tamarack group, area 4 claims, bought for \$80,000; Monte group, area 4 claims, bought for \$15,000, giving an investment of \$432,000 in mining lands for the two years. With these recent purchases, the mineral lands of the company form a compact tract of 8,000' east and west by 9,000' north and south, giving nearly two miles of the strike of the mineral zone. Miscellaneous landed holdings include a 61-acre limestone quarry, for flux, and several hundred town lots, at Grand Forks and Phoenix, also 500 acres at Carson, British Columbia.

Country rock is andesite, carrying two wide fissure veins in quartz-diorite, these having an approximately north and south strike, with a surface dip of 50° to the eastward, and a somewhat sharper dip at depth. Ore bodies are an altered tuff, estimated by company at 80' average width, which is an ultra-conservative figure. Ore is exclusively chalcopyrite, averaging about 1.7% copper only, with an average of 0.4 oz. silver and \$1.50 gold per ton, the ore carrying only 5% to 6% sulphur. The main ore body ranges up to 400' width, at points, and has been opened to a depth of 500', while diamond drill borings have shown it to continue, with unaltered values, to a depth of at least 800'.

The mine is opened by shafts of 200' and 400', and by tunnels of 1,500', 2,600', 2,400' and 2,500', with 6 miles of crosscuts and drifts, giving a total of 8 miles of underground workings. Notwithstanding this very respectable total of strictly underground openings, the principal developments are open-cast, the present policy of the management being to extract the bulk of the ore from glory-holes, which are immense open quarries. These open pits are worked in 100' benches, from which 50' slices are taken by 3 steam shovels, the largest having a daily capacity of about 1,500 tons, ore being shattered by blasting before removal by shovels, and are milled through winzes to underground tunnels, for loading and removal. The largest pit is 400x1,000' in area and the plans of the company practically call for the mining off of an entire mountain. Ore reserves were esti-

mated, 1904, by the company, at 20,000,000 tons, but actually were much larger, and have been greatly added to since. It has been proposed to drive a four-mile double-track railway tunnel into the mountain, from Boundary Creek, to tap the ore bodies, now opened on surface, at a depth of about 4,000'. Should this tunnel show a continuation of the immense vein at that depth, as it possibly would, the Granby's ore body then would be proven much larger than the combined ore reserves of the Rio Tinto.

No. 2 shaft has a 12x16" double-cylinder hoist, and a 3-compartment shaft is being sunk on the Victoria claim, centrally located on the Granby's mineral tract. This shaft, owing to its large size, and comparatively shallow depth, is expected to have a capacity of 1,500 tons per 8-hour shift.

Three tunnels are double-tracked and equipped with electric-traction, having 75-h.p. motors drawing ten-ton ore-cars. These tunnels are equipped, at their portals, with ore-crushers and 2,000-ton ore bins. There are three crushers, of 150 tons hourly capacity each. At the portal of No. 3, the upper tunnel, is a 22x55' crusher-house with a Farrell-Bacon style Bore crusher, having steel jaws 30x42" in size, of 150 tons hourly capacity, driven by a 100-h. p. electric motor. The crusher is capable of breaking masses of nearly one cubic yard in size, to chunks not larger than 7" to 8". A duplicate crusher, made by the Jenckes works, is located at the mouth of No. 4 tunnel. The crusher weighs 113,000 lbs., and has a frame of semi-steel, with tensile strength of 32,000 lbs. to the square inch. Ore from the bins is shipped to the smelter over the Great Northern railway, and a train of 35 thirty-ton cars can be loaded in 25 minutes. The mine is served by both the Great Northern and Canadian Pacific railways.

Equipment at the mine includes all necessary machinery, but the mining plant, from the nature of operations, is much less powerful and costly than is found at many smaller mines operated to greater depths, and exclusively underground. There are 250-h. p. hoists, good for 1,000' depth, at each shaft. The compressor-house, 60x121' in size, houses two air-compressors, and 65 rock-drills are in use in the mine. The compressors are electrically driven by rope transmission from two 700-h. p. Westinghouse type C induction motors. The principal compressor is a Rand tandem-compound, with 16x30" high-pressure cylinders and 28x36" low-pressure cylinders, capable of compressing 6,000 cubic feet of free air per minute to a pressure of 70 lbs. per square inch, and is rated at 60-drill capacity. The mine buildings include a 40x80' machine shop, 40x50' smithy and 40x40' carpenter shop, all of frame construction. The company owns 20 dwellings and 2 hotels at Phoenix, the Granby hotel being a \$25,000 three-story structure with electric light and steam-heat.

The mine has 2,000 h. p., and the smelter uses 1,500 h. p., this being furnished from an electric plant at Kettle Falls, on the Columbia river, Washington. These falls are among the largest natural water powers of North America, and, with added equipment can generate as much power as the mine and smelter are likely ever to require.

The smelter, at Grand Forks, 24 miles from the mine, is connected therewith by the Canadian Pacific railway, there being a drop of 2,000' on the loaded haul, in this distance. The reduction plant is much the largest and best in Canada, and among the smelters of the world ranks only after those of the Anaconda and Copper Queen. The capacity of the plant is 3,000 tons per diem, and the smelter is operated three 8-hour shifts daily. The plant is being enlarged constantly, in a vain attempt to keep pace with the possibilities of the great mine behind it, and, large as it already is, has by no means reached its ultimate limit of size, which, in all likelihood, will not be less than 10,000 tons daily, and may be more, in time. The smelter has 6,000-ton steel ore-bins and six 300-ton rectangular blast-furnaces, each 44x160' at the tuyeres, and two 400-ton furnaces, each 48x208' at the tuyeres, added 1905. The six old furnaces may be rebuilt to much larger size. The two larger furnaces have 24 tuyeres on each side. An ingenious system of charging, devised by Mr. A. B. W. Hodges, effects great economies in this branch of work, saving labor and giving more regular feed. The charges are supplied to the furnaces in two-ton cars, one 20-h. p. electric motor handling two cars, only one man being required to attend to the charging of two furnaces. The ore is practically self-fluxing, and with a little limestone and necessary fuel, is charged without concentration or assortment. The first-fusion product is a 40% matte, which is carried molten, in ladles, by a 40-ton electric traveling crane, to the converter building, 68x160' in size, which is 100' from the furnace building. The converter department has 3 stands, with shells 70x110," of the horizontal barrel type, shells being tilted in stands by Allis-Chalmers hydraulic accumulators. There are three mould-carriers under each stand, and product of the converters is a 99% blister copper carrying 40 oz. silver and 8 oz. gold per ton, which is shipped to the Laurel Hill works of the Nichols Chemical Co., for electrolytic refining, and parting of gold and silver values. In the converter building is the lining department, equipped with a crusher and two silica-mills. Slags were granulated, but are now dumped hot, four 8x14" locomotives traversing a 36" railway line with slags.

Electric power is used exclusively at the smelter, machinery equipment including nine blowers, being one for each furnace, with an auxiliary in reserve. A new Connorsville blower, of 30,000 cubic ft. capacity per minute, is to be installed, with a direct-connected 300-h. p. motor. Converter blast is supplied by a new Allis-Chalmers double-cylinder air-compressor, with capacity to compress 6,000 cubic ft. of free air per minute to a pressure of 10 lbs. per square inch, actuated by a direct-connected 300-h. p. motor.

The wooden framework of the smelter buildings is being replaced by steel, and all structures are to be thus replaced, eventually. A new steel-frame warehouse and a roundhouse were built at the smelter, during 1905.

Much trouble was experienced, in the early years of production, in securing adequate coke supplies, and to obviate future difficulties from this source, the International Coal & Coke Co. was organized, 1903, with a capitalization of \$3,000,000, by practically the same shareholders as those of

the Granby, although the corporations are distinct. The International company has extensive high-grade deposits of coking coal at Blairmore, Alberta, Northwest Territory, and furnishes the Granby an assured supply of coke for the furnaces.

Production, for the fiscal year 1905, was 14,237,622 lbs. fine copper, and, for the calendar year 1905, was 17,843,390 lbs. copper, 217,472 oz. silver and 50,694 oz. gold. At the close of 1905 the mine was making about 2,000,000 lbs. fine copper monthly, and netting approximately 10 cents per lb., or \$200,000 per month, therefrom. The enlargement of the six old 300-ton furnaces will give the smelter a daily capacity of about 3,600 tons, before the close of 1906, putting the Granby plant second only to the Anaconda in size, and adding 20% to the present productive capacity. By the close of 1906, copper should be made for about 8 cents per pound—a remarkable achievement, considering the exceeding low grade of the ore. Both mine and mill have been brought to a high state of efficiency, and the cost-sheet is one of which any directorate well might be proud. There will be no cessation of effort however, and the skill and energy of the management assure further reductions in cost per ton mined and smelted, as well as an increase in tonnage handled, and production secured. The Granby is one of the few copper properties of the world of which a careful investigation leads to the verdict that there is nearly everything to commend, and scarcely anything to criticise.

GRAND CANYON COPPER CO.

ARIZONA.

Mine office: Grand View, Coconino Co., Ariz. Mine is located near the bottom of the Grand Cañon, 3,000' below the rim. Idle.

GRAND CENTRAL MINING CO.

UTAH.

Mine office: Tintic, Juab Co., Utah. Patrick Donnelly, superintendent. Is an auriferous silver-lead mine, carrying appreciable values in copper, extensively developed, and a considerable producer. Employed about 90 men, at last accounts.

GRAND DEPOSIT COPPER CO.

NEVADA.

Office: Cherry Creek, White Pine Co., Nev. John Stanton, president; J. S. Page secretary; Pierre de P. Ricketts, treasurer. Organized 1903. Lands are the Grand Deposit group, said to show considerable ore bodies, giving assays of 7% to 12% copper.

MINAS GRANDE y COBRE GRANDE.

MEXICO.

Letters returned unclaimed from former mine office, Fronteras, Sonora, Mexico.

GRAND GULCH COPPER MINING CO.

ARIZONA.

Office: care of Messrs. Schirmer, Chapin & Emmons, 79 Milk St., Boston, Mass. Mine office: St. George, Washington Co., Utah. Samuel Newhouse, general manager. Property is in the extreme northern part of Arizona, and more accessible from Utah than from southern or central Arizona. Main shaft is 370' deep. Shipment of 1,000 tons of ore to Salt Lake smelters gave average returns of 48% copper, netting \$99,970. Ore was carefully selected, and hauled 140 miles by wagon. Equipment includes a small and antiquated smelter.

GRAND GULCH MINING CO.**ARIZONA.**

Succeeded by Grand Gulch Copper Mining Co.

GRAND JUNCTION SMELTING CO.**COLORADO.**

Office: 79 Milk St., Boston, Mass. Works office: Grand Junction, Mesa Co., Colo. I. N. Patterson, president; J. V. Howard, secretary; Geo. E. Marvin, general manager. Has a considerable indebtedness, held by shareholders. Has a partly built custom smelter, planned for steam and electric power, which company planned to blow in early in 1905, but failed to so do. Affairs apparently badly involved.

GRAND MARAIS COPPER MINING CO.**MINNESOTA.**

Had lands in Cook county, Minnesota. Idle, and company apparently moribund.

GRAND MOUNT LYELL COPPER CO., LTD.**TASMANIA.**

Mine office: Mt. Lyell, Montagu Co., Tasmania. Lands, sundry claims, in Sections 682, 789 and 1,674, slightly prospected.

GRAND PRIZE COPPER MINING CO.**ARIZONA.**

Dead. Lost lands, 1902, for debt.

GRAND RAPIDS COPPER CO.**WYOMING.**

Dead. Lands sold to Saginaw Valley Copper Mining Co.

GRAND REEF COPPER MINING CO.**ARIZONA.**

Office: care of Clarence H. Mackay, 253 Broadway, New York. Mine office: Aravaipa, Graham Co., Ariz. James Quinn, superintendent. Lands, sundry claims, presumably patented, on which large sums were expended, in development and equipment, latter including a 3-stamp mill and 90-ton smelter. Idle for some years.

GRAND REPUBLIC COPPER MINING CO.**COLORADO.**

Office: 52-240 La Salle St., Chicago, Ills. Letter returned unclaimed from former mine office, Pearl, Larimer Co., Colo. W. A. McGuire, president; E. V. Boisot, secretary and treasurer. Organized 1902, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 7 claims, area 70 acres, in the Big Horn district, 7 miles south of Pearl, showing a 3' paystreak, carrying considerable native copper, in a schistose vein, cut at depth of 130' by a 200' shaft. Also has a sulphide ore body.

GRAND TRAVERSE & ARIZONA MINING CO.**ARIZONA.**

Office: 129 East Front St., Traverse City, Mich. Mine office: Cave Creek, Maricopa Co., Ariz. Employs 3 to 10 men. Thos. Smurthwaite, president and general manager; Walter E. Greilick, vice-president; Chas. F. Smurthwaite, secretary and treasurer; preceding officers, Warren A. Cartier and Philip Shermer, directors; H. Bolin, superintendent. Organized May 6, 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par; issued, \$1,150,000. Lands, 22 claims, area 440 acres, in the Cave Creek district, showing 9 veins, of which 3, under development, have average widths of 8', 14' and 18', giving assays of 5% to 35% copper, 8 oz. to 12 oz. silver and \$8 to \$120 gold per ton, from oxide, carbonate and sulphide ores. Is opened by 5 pits and shafts, deepest 70' and 170', and by tunnels of 60' and 105'. Nearest railroad, 38 miles.

GRANDVIEW MINING & MILLING CO.**UTAH.**

Said to have lands in Utah, near the Colorado line, from which ore giving good assay values in gold, silver and copper, has been secured.

LA GRAN FUNDICIÓN CENTRAL MEXICANA.**MEXICO.**

Is the Aguascalientes branch of the American Smelting & Refining Co.

GRANITE CREEK SMELTING & REDUCTION CO.**NEVADA.**

Presumably dead. Disappeared from Golconda, Humboldt Co., Nev.

GRANITE WELLS MINING CO.**CALIFORNIA.**

Office: 716 Lankershim Bldg., Los Angeles, Cal. Lands are sundry claims in San Bernardino county, California, showing a stained quartzite capping 60' wide and 200' long, standing 30' above surface, underlaid by a pipe vein of 2" to 2' width, between quartzite, gneiss and syenite, carrying very rich ores, mainly cuprite, assaying 17% to 62% copper, in the upper levels, turning to sulphide ores at a depth of circa 250'. Company claims to have 200 tons of very rich ore on the dump.

LA GRAN PROVEEDORA DE COBRE, S. A.**MEXICO.**

Is the Mexican incorporation of the Arizona-Mexican Copper Co.

GRANT COPPER MINING CO.**COLORADO.**

Office: Encampment, Wyo. Letters returned unclaimed from former mine office, Pearl, Larimer Co., Colo. Leo Davis, president; C. W. Taylor, vice-president; H. D. Ashley, secretary; Theo. Davis, treasurer. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000. Lands, 3 claims, one-half mile from Pearl, alleged to show a 12' vein giving average assays of 10% copper. Idle several years.

GRANVILLE COPPER CO.

Office: 519 Gaither Estate Bldg., Baltimore, Md.

GRAPHIC MINE.**NEW MEXICO.**

Office: care of Sherwin-Williams Paint Co., Cleveland, Ohio. Mine office: Magdalena, Socorro Co., N. M. Lands, in the Kelley district, show a 65' vein; with a 12' paystreak said to average 13% copper, opened by tunnel. Country rocks are limestone of Carboniferous age, shales and quartzite. Ores are argentiferous galena, smithsonite, cuprite and native copper. Mine produced about \$30,000 in values, before taken over by present owners, and was shipping about 100 tons daily, at end of 1905, to Joplin, Missouri, the zinc ore being used for making zinc oxide, for pigments. Management is said to plan increasing production to 200 tons daily.

GRASLITZER KUPFERBERGBAU.**AUSTRIA.**

Mine office: Eilenberg, Bohemia, Austria. Mines are very ancient, and were one of the principal sources of European copper supply, during the Middle Ages. Vein is 12' to 15' wide, in clay-slate. Mines were reopened on a large scale, 1901, and a new smelter built, but the experiment does not seem to have proven successful.

GRATIOT MINING CO.**MICHIGAN.**

Office: 12 Ashburton Pl., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Quincy A. Shaw, Jr., president; Rudolph Agassiz, vice-president; preceding officers, Alexander Agassiz, Francis L. Higginson and

Francis W. Hunnewell, directors; Geo. A. Flagg, secretary and treasurer; James MacNaughton, general manager. Organized January 29, 1906, under laws of Maine, with capitalization \$300,000, shares \$3 par, full-paid and nonassessable. Is a subsidiary corporation of the Calumet & Hecla Mining Co., formed for the purpose of taking over 600 acres of land lying north of the Mohawk mine, supposedly carrying the northern extension of the Kearsarge amygdaloidal bed. Is considered exceptionally promising.

O. B. GRAY COPPER CO.**NEW JERSEY.**

Mine office: Pennington, Mercer Co., N. J. Organized May, 1901, with capitalization \$250,000. Vein is claimed to be 30' wide and one-half mile long. Idle since shortly after birth.

GRAY EAGLE & HARD TIMES MINES.**COLORADO.**

Letter returned unclaimed from former mine office, Silver Cliff, Colo.

GREAT BELCHER OF ARIZONA CO.**ARIZONA.**

Office: 519-10 Wall St., New York. Mine office: Yavapai Co., Ariz. Isaac W. Mason, president and treasurer; Henry B. Clifford, vice-president; P. H. Noel, secretary, T. S. Henderson & Co., fiscal agents. Organized under laws of Arizona, as successor of the Great Belcher-Bullwhacker Gold Co., which, in turn, was a merger of the Great Belcher Gold & Copper Co., Bullwhacker Mining Co., Empress Mining Co., Sunlight Mining Co. and Queen of Arizona Copper Co. Extent of lands of present company unknown, but includes the Great Belcher mine, one patented claim, which is said to have produced \$700,000 in ore values, in the past, and which has a 700' main shaft, with circa 4,000' of underground openings. Company claims a 17' vein of ore, averaging \$12 per ton, mainly in gold, on the 700' level, and plans sinking to 1,000'.

GREAT BELCHER-BULLWHACKER GOLD CO.**ARIZONA.**

Reorganized, circa 1905, as Great Belcher of Arizona Co.

GREAT BELCHER GOLD & COPPER CO.**ARIZONA.**

Reorganized as Great Belcher-Bullwhacker Gold Co.

GREAT CENTRAL FREEHOLD MINES, LTD.**AUSTRALIA.**

Voluntarily liquidated, 1903.

GREAT CENTRAL MINES.**AUSTRALIA.**

Mine office: Mt. Hope, Blaxland Co., N. S. W., Australia. J. Martin, superintendent. Lands, 939 acres, at South Mt. Hope, showing large bodies of low-grade ores, which are oxides and carbonates to about 250' depth, succeeded by sulphides. Oxidized ores have a decomposed porphyry gangue, sulphide ores occurring in brecciated porphyry. Has steam power and a small smelter, and is hampered by a somewhat uncertain water supply.

GREAT COBAR COPPER MINING SYNDICATE.**AUSTRALIA.**

Offices: Equitable Bldgs., Sydney, Australia. Mine office: Cobar, Robinson Co., N. S. W., Australia. Works office: Lithgow, N. S. W., Australia. Employs circa 300 men. Dr. Richard Read, mining director; Wm. Longworth, general manager; G. H. Blakemore, mine manager. This is the most important copper producer of New South Wales, having been first opened in 1869, and closed 1892, after failure to reduce sulphides in a rever-

beratory furnace. Production, during this period, was 26,611 long tons of fine copper, made from rich oxidized ores averaging 11.07% in copper tenor, and considerable dividends were paid. Was reopened, 1892, by tributors, on a 10-year lease, and at close of 1902 had produced, under their management, 730,669 tons of ore, giving average returns of 3.27% copper. A long-standing dispute between the tributors and the fee-owners was settled, 1903, through the purchase of the property by the tributors, who form the present syndicate, which is not incorporated.

Lands, 80 acres mining lands and 970 acres miscellaneous lands, freehold, including the townsite of Cobar, also the Nymagee copper mine, at Nymagee, the Great Peak gold mine at Cobar, sundry coal mines at Lithgow and Rix Creek, yielding, good coking coal, and the Lithgow Copper Smelting & Refining Works, at Lithgow. The Great Cobar mine works three veins of nearly vertical dip, known as the East, Middle and West lodes, principal openings being on the latter. Country rock is Silurian slate, and the ore, which is auriferous and bismuthiferous, occurs in lenses, 50' to 70' in width by 200' to 300' in length, and of indefinite depth. The oxidized zone extends to an average depth of circa 250', below which the ore is mainly chalcopyrite, with some cupriferous pyrrhotite, the average copper tenor of the entire mine being about 4%, with circa 0.5 oz. silver per ton. Ore is won by overhand stoping, with 10' pillars left beside the shafts, and timbering is by bulkheads, filled with waste, this being known locally as the "pigstye" system. The ore is first broken in immense masses, then reduced to smaller size by block-holes and pop shots. The West lode, opened by an 820' shaft, is 70' wide, at points on the 90-fathom level, and the mine works about 20 stopes. The "New" shaft is 850' deep. The mine has about 11,000' of workings, and is estimated by owners to show about 2,000,000 tons of ore. Owing to the aridity of the country, operations were hampered, in dry seasons, by lack of water, hence a new dam has been built, impounding circa 100,000,000 gallons of water, and water cost now averages about 8s. per thousand gallons.

The Nymagee mine, opened 1880, at Nymagee, Priory Plains, Mouramba county, New South Wales, is about 50 miles from the Great Cobar, but lacks railway facilities. Country rocks are slate and sandstone, the main ore body being 15' to 20' in width, and carrying 10% copper, in a chute about 250 long and of indefinite depth. Has 3 shafts, deepest 734', and ores outside of the rich chute average about 2% copper only, hence are unworkable. The Nymagee has a pyritic smelter, with water-jacket blast-furnaces, and a reverberatory furnace for blowing up matte to blister copper averaging 99.75% in tenor.

The Peak, or Great Peak, gold mine, has a stamp-mill, and as the ore is silicious and free from iron and sulphur, it would seem a highly suitable flux for the basic ores of the Cobar and Nymagee copper mines.

The Lithgow smelter has five 100-ton water-jacket blast-furnaces, turning out blister copper carrying about \$40 per ton gold and silver values, which is refined in an electrolytic plant, installed 1902. The new smelting

plant at the Great Cobar mine has two 300-ton water-jacket blast-furnaces, with continuous discharge of molten matte and slag into forehearths, and thence into settlers, whence slag skims into one-ton Nesmith slag-pots, which are drawn to the slag-dump by a small locomotive. Fuel at mine is wood and bituminous coal, costing, respectively, 7 shillings and 21 shillings per long ton, and for the smelter, coke, costing 42s. per ton, is used. A producer-gas plant is being added, for reverberatory smelting, and it is planned to increase the length of the reverberatories to about 50' each.

Production, 1903, was circa 9,000,000 lbs. fine copper, made from approximately 140,000 tons of ore smelted, and presumably was about 11,000,000 lbs. in 1905. The management is cautious, yet liberal, and deserves great credit for having taken the mine, under many disadvantages, and making it a success. The Great Cobar is second only to the Wallaroo & Moonta, among Australian copper mines, and bids fair to become an increasingly important producer.

GREAT CONDURROW TIN & COPPER MINING CO., LTD. ENGLAND.

Dissolved, January 13, 1905.

GREAT DIVIDE GOLD CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Redding, Cal.

GREAT DIVIDE MINES CO.

UTAH.

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Lincoln, Tooele Co., Utah. Henry A. McCornick, president; Walter A. Cooke, vice-president and manager; Joseph H. Hurd, secretary; Rodney T. Badger, treasurer; John B. Taylor, superintendent. Organized Aug. 15, 1903, under laws of Utah, with capitalization \$2,000,000, shares \$5 par. Lands, 40 claims, about half patented, area 560 acres, also a 10-acre millsite, fairly timbered, showing fissures in and contacts between limestone and Cambrian quartzite, of which the main vein is said to range 12' to 50' in width, carrying ores said by company to assay 6% to 20% copper, 2 oz. to 100 oz. silver, and from a trace to \$150 gold per ton. Development is by a 1,300' tunnel. Mine was opened 1898, and has been under slow but continuous development since. Property is considered promising.

GREAT DYLFIELD LEAD & COPPER MINES, LTD.

An English corporation. Moribund.

GREAT FREEHOLD MINE.

AUSTRALIA.

Owned by Queensland Copper Co., Ltd.

GREAT LAKES COPPER CO.

ONTARIO.

Office: care of J. Wesley Allison, 51 East 44th St., New York. John McKinley, president; Horace Williston, secretary; Robert Sloane Bickford, treasurer. Organized 1900, under laws of West Virginia, with capitalization \$3,000,000, shares \$5 par. Lands, upwards of 4,000 acres, near Sudbury, Algoma, Ontario, carrying nickeliferous chalcopyrite, associated with iron pyrites. Has several shafts, deepest 150', also an open-cut, with a considerable amount of ore in sight. The Graf smelting process was tried, but proved a failure. Property is mortgaged, and affairs of corporation are in what seems a hopeless muddle.

GREAT LAKES MINING & MILLING CO. WYOMING.

Letter returned unclaimed from former mine office, Encampment, Wyo.

GREAT LAKES MINING & SMELTING CO. WYOMING.

Office: Manitowoc, Wis. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Isaac Craite, president; R. W. Burke, vice-president; J. V. Miller, secretary; C. H. Seeger, treasurer; F. C. Miller, manager. Apparently moribund.

GREAT LAXEY, LTD. ENGLAND.

Offices: 55, Cross St., Manchester, Eng. Mine office: Laxe, Isle of Man, England. F. J. Robertshaw, chairman; J. Roberts, mine manager; J. Crossley, secretary. Organized March 3, 1903, as a reconstruction of the Great Laxe Mining Co., Ltd., with capitalization £30,000, shares 10s. par, in 45,000 cumulative 10% preferred and 15,000 ordinary shares. Lands, 1,103 acres, held under 31-year leases, expiring October, 1933, with royalty of one-eightieth to October, 1907, and one-fortieth thereafter. Lands carry lead, zinc and copper ores. Property is noted chiefly for the possession of the largest water-wheel in the world, but this has survived its usefulness, and has been displaced by a new power plant.

GREAT MAMMOTH COPPER MINING CO. WASHINGTON.

Dead. Promoters sold their own stock and pocketed the proceeds.

GREAT MOUNT LYEEL COPPER CO., LTD. TASMANIA.

Reorganized, 1903, as Ballarat & Lyeel Mines, Ltd.

GREAT NORTHERN COPPER CO. NEWFOUNDLAND.

Office: Corey & Braddock Aves., Braddock, Pa. Mine office: Twillingate, Newfoundland.

GREAT NORTHERN COPPER & GOLD MINING COMPANY OF QUEENSLAND. AUSTRALIA.

Reorganized, July 31, 1903, as Rosewood Creek Copper & Gold Mining Co., Ltd.

GREAT NORTHERN COPPER MINING CO. NEVADA.

Office: care of S. H. Browne, secretary and treasurer, Ogden, Utah. A. W. McGee, president; Daniel Covery, vice-president. Organized 1904, under laws of Utah, with capitalization \$100,000, shares \$1 par. Lands, sundry claims, known as the Great Northern group, in the Sierra Madre district of Box Elder county, Utah.

GREAT NORTHERN GOLD & COPPER MINING & MILLING CO. OREGON.

Mine office: Lostine, Wallowa Co., Ore. E. T. Sluer, superintendent. Lands, 13 claims, south of Lostine, said to show high-grade copper and silver ores.

GREAT NORTHERN MINING CO. WASHINGTON.

Letter returned unclaimed from former mine office, Baring, Wash.

GREAT PECK MINING CO. ARIZONA.

Office: 519-10 Wall St., New York. Hon. J. A. Beidler, president; Hon. James Tawney, secretary and treasurer; preceding officers, Hon. E. A. Minor, Hon. Herman G. Goebel, Hon. James H. Southard, Hon. Wm. E.

Brown, Hon. Lucius N. Littauer, Hon. J. W. Babcock, Wm. E. Bixby and Melville Woodbury, directors; Peter Giroux, general manager. Knickerbocker Trust Co., New York, registrar. Organized 1902, under laws of Arizona, with capitalization \$2,500,000, shares \$5 par. Lands, 2 claims, area 40 acres, patented, known as the Great Peck mine, which was a considerable silver producer in the past, until closed down by litigation. Mine carries silver, gold and copper values, and has about 5,000' of workings. Officials are principally members of the United States Congress.

GREAT REPUBLIC COPPER & GOLD MINING CO.

ARIZONA.

Office: 31 Bank of Arizona Bldg., Prescott, Ariz. Mine office: Turkey, Yavapai Co., Ariz. Employs 12 men. John Milton Sullivan, president and general manager; S. S. Ballard, vice-president; F. E. Jordan, secretary and treasurer; Geo. W. Oakman, assistant secretary and superintendent. Organized May 1, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 33 claims, in three groups, area upwards of 600 acres, in the Black Canyon district, on lower Turkey creek. Has shafts of 91', 136' and 725', also a 315' tunnel, showing 3 veins, claimed by company to average 50' in width, carrying malachite, azurite, bornite, chalcopryite and chalcocite, said to average 5% to 5.25% copper and 2.5 oz. silver per ton. Has a 15-h. p. gasoline hoist, and is only 2½ miles from Prescott & Eastern railroad. Management plans sinking and crosscutting to determine the size of its ore bodies. Officers stand well locally, and property is considered promising.

GREAT STANDARD COPPER MINING CO.

WYOMING.

Office: care of Colonial Security Co., 161 Summer St., Boston, Mass. Letter returned unclaimed from former mine office, Granite Canyon, Laramie Co., Wyo. Dr. Walter H. Parker, president; John Laughrey, vice-president and general manager; Chas. B. Lamont, secretary; M. E. Roberts, superintendent. Organized Sept. 30, 1902, under laws of Arizona, with capitalization \$1,000,000, shares 50c. par. Lands, 17 claims, also sundry miscellaneous lands, giving total holdings of 640 acres, in the Silver Crown district, showing 6 veins of about 8' average width, opened by 18 shallow shafts and pits, said to give average assays of circa 7% copper, from oxides, carbonates, sulphides and chlorides, with occasional native copper. Idle since March, 1904, from lack of funds.

GREAT VERDE CONSOLIDATED MINE.

CALIFORNIA.

Office and mine: care of John Reed Lyle, manager, Sisson, Shasta Co., Cal. Is a copartnership, capitalized at \$20,000, with 4 owners. Lands, 12 unpatented claims, claimed to adjoin the Balaklala mine, but actually located elsewhere, which are claimed to show an ore body of 80' average width, claimed to carry chalcopryite assaying 6% copper, 6 oz. silver and \$7 gold per ton, opened by 5 tunnels, longest 150'. Is idle, and is not known ever to have produced any ore, statements to the contrary notwithstanding.

GREAT WESTERN COPPER CO.

ARIZONA.

Office: Clinton, Iowa. Mine office: Tombstone, Cochise Co., Ariz. Wm. J. Young, Jr., president; Edw. Young, secretary; Paul B. War-

nekros, manager; D. W. Brown, superintendent. Capitalization, \$1,000,000. Lands, 23 adjoining claims, in the Dragoon Mountains, showing argentiferous copper ores. Has steam and gasoline power. Idle.

GREAT WESTERN COPPER CO.

MONTANA.

Letter returned unclaimed from former mine office: Butte, Silver Bow Co., Mont. Organized 1906, with capitalization \$1,000,000, shares \$1 par. Lands, 2 claims, known as the Great Western and Henry, adjoining the Robert Emmett No. 2, on the north.

GREAT WESTERN COPPER CO.

NEVADA.

Office: 113 Devonshire St., Boston, Mass. Letter returned unclaimed from former mine office, Reno, Washoe Co., Nev. Geo. D. Burton, president; Frank B. Cox, secretary. Organized 1901, with capitalization \$1,000,000, shares 10c. par. Lands, 62 acres, in the Pea Vine district, having 2 shafts, deepest 200', and an 800' tunnel. Vein is claimed to range 2' to 17' in width, and to average 12% copper, with gold values, which is not the truth. Present whereabouts of Cox, the promoter, are unknown. Stock presumably is worthless.

GREAT WESTERN GOLD CO.

CALIFORNIA.

Office: 506 Continental National Bank Bldg., St. Louis, Mo. Mine office: Redding, Shasta Co., Cal. Employs 140 men. T. S. Henderson, president; O. E. Adams, vice-president; M. E. Dittmar, managing director; C. J. Balmer, secretary and treasurer; preceding officers, A. R. Fleming, C. P. Keller, Thos. Walsh and P. H. Noel, directors; W. G. Scott, general manager; S. E. Bretherton, general superintendent; Herbert Haas, smelter superintendent; Jos. Wollis, mine superintendent. As near as can be ascertained, was incorporated 1901, with capitalization \$10,000,000, increased, circa 1905, to \$12,000,000, shares \$1 par. Management evades all inquiries as to capitalization and finances, though repeatedly complaining that the company has not been given fair treatment in preceding issues of the Copper Handbook.

Lands, circa 1,600 acres, 1,290 acres patented, including the Afterthought mine, area 459 acres, the Liberty mine, Last Chance, Section 15, Bull and 10 other groups, also a bond and lease on the Donkey mine. Lease on the Garcia mine, Arizona, was forfeited. The Afterthought mine, in the Furnaceville district, 20 miles east of Redding, is the principal property, and the present producer. Former developments included a 300' shaft and 7 tunnels, of about 2,000' aggregate length, showing a large body of low-grade sulphide ore, with occasional occurrences of medium and high-grade sulphide ores. Company claims ore will average \$30 per ton in value, which is a serious overestimate, as ore is chalcopyrite and sphalerite, disseminated in iron pyrites. Main working tunnel is 848', planned to be driven 4,500', and has cut a 20' ore body in the Copper Hill zone, at 500' below the crest. Mine shows considerable sphalerite, which has given assays up to 42% zinc. Title to the Liberty group, near Redding, apparently is in dispute. This property carries auriferous copper ores of undetermined value.

The smelter, $1\frac{1}{2}$ miles from the mine, and connected therewith by a private railway line, has steam and electric power, and two furnaces, with

installation of a third said to be contemplated. The first furnace, 40x96" at the tuyeres, and rated at 150-tons daily capacity, was blown in, March 24, 1905. The smelter has not worked smoothly, for reasons variously given, according to bias of the commentators. It is said that management plans building a bag-house, to recover zinc oxide from the smelter fumes.

The company was promoted by T. S. Henderson & Co., a St. Louis brokerage firm of dubious reputation, and the early financiering of the Great Western Gold Company was not of a nature to recommend the property to conservative investors. The president states that \$160,000 indebtedness was paid during 1905—but neglects to state how much indebtedness remains unpaid. Company has evaded all definite statements regarding its organization, finances or production. The mine may be and perhaps is good, but the Henderson management is regarded with much suspicion.

GREAT WESTERN GOLD & COPPER CO.

UTAH.

Mine office: Park City, Summit Co., Utah. Bishop Robert Brighton, general manager. Lands, sundry claims, adjoining the Daly Judge, showing vein matter of about 100' width, giving assays of 3% to 5% copper. Is driving a tunnel, planned to cut this ore body at about 2,000' length.

GREAT WESTERN GOLD & COPPER

COLORADO & MONTANA.

MINING CO.

Office: care of W. J. Willingham, Equitable Bldg., New York. Chas. G. Eckert, president. Organized under laws of South Dakota, with capitalization \$500,000, shares \$1 par. Had a bond and lease on a gold claim at Cripple Creek, Colorado, also one claim, area 20 acres, near Butte, Silver Bow county, Montana, at last accounts. Company financially exhausted.

GREAT WESTERN ORE PURCHASING &

CALIFORNIA.

REDUCTION CO.

Works office: Swansea, Inyo Co., Cal. Is building a 150-ton smelter, and is said to be reopening old mines at Cerro Gordo.

GREENBACK COPPER CO.

CALIFORNIA.

Mine office: Woody, Kern Co., Cal. Jos. Werringer, lessee. Lands, 1,520 acres, 18 miles from Southern Pacific railroad. Mine was idle from 1900 until reopened late in 1905. Country rock is grano-diorite, showing an ore chute carrying lenses of 20' maximum width, with granite walls irregularly impregnated with chalcopryite. Development is by a 185' incline shaft, with 3 levels opened. Carbonate ores stoped from the upper levels have averaged 19.4% copper and 5.7 oz. silver per ton.

GREENE CONSOLIDATED COPPER CO.

MEXICO.

Office: 24 Broad St., New York. Mine office: La Cananea, Sonora, Arizpe, Mexico. Wm. C. Greene, president; Mark L. Sperry, vice-president; Philip Berolzheimer, treasurer; Geo. S. Robbins, secretary; Emil Berolzheimer, W. D. Cornish, Wm. C. Greene, Henry Ollesheimer, Myron M. Parker, Alfred Romer, Mark L. Sperry, and Jacob Weidmann, executive committee; Charles Adsit, Thomas H. Anderson, Emil Berolzheimer, W. D. Cornish, W. B. Devereaux, Silas W. Eccles, W. C. Greene, Henry Ollesheimer, My-

ron M. Parker, R. W. Pillsbury, Epes Randolph, Edward C. Rice, Geo. S. Robbins, Alfred Romer, J. B. Showalter, Galen L. Stone, Mark L. Sperry, Jacob Weidmann, Eugene W. Foss, H. C. Hulbert, Thos. P. Wilson, W. A. Woodbury, L. D. Baldwin and A. Bleecker Banks, directors; Arthur S. Dwight, general manager; Geo. Young, general auditor; John McHenry, mine superintendent; David Cole, concentrator superintendent; K. J. Williams, smelter superintendent; Dr. W. J. Galbraith, chief surgeon. Employs about 4,000 men.

Organized Sept. 15, 1899, under laws of West Virginia, with capitalization (increased 1904 and 1906,) \$10,000,000, shares \$10 par, non-assessable. Paid dividends of \$1,900,800 in fiscal year 1905, and paid total dividends of \$2,812,000 to July 31, 1905. Pays bi-monthly dividends of 40 cents per share. The increase of capitalization in 1906 gave the company \$3,400,000 additional cash of which approximately one-half is to be used for construction, and balance added to working capital. Fiscal year ends July 31. Has 5,226 shareholders. Stock is listed on the Boston Stock Exchange. Property represents an investment of about \$12,000,000.

The mining lands of the company include 4,214 pertenencias of one hectarea each, equivalent to 10,412 acres, the tract having a boundary line of $32\frac{1}{2}$ miles, and including about 40 old mines and prospects, located in the Cananea Mountains, in the free zone of northern Sonora, about 20 miles south of the Arizona border. The Cananea range is about 25 miles in length and 6 to 10 miles in width, with a northwest and southeast axis, divided into two plainly marked and nearly equal sections by Puertecitos Pass, the Greene mines being in the southern half of the range, and on a mineral belt apparently having a strike practically parallel with that of the range.

In addition to mining lands, the company also holds 486,000 acres of timber and grazing lands, leased for 8 years to the Cananea Cattle Co. The mines are in the municipality of Ronquillo, and the principal administrative buildings are in that municipality, near the smelter. The company owns the townsite of La Cananea, on the mesa to the eastward of Ronquillo, and therein are located the best dwellings, hotels and public buildings. Franchises are held for electric light, water, ice, traction and telephone services. There was much litigation over titles, but the lands were redenounced in 1902, and the Cananea Consolidated Copper Co., S. A., now holds title direct from the Mexican government, the property of the Greene Consolidated Copper Co. consisting of practically the entire stock issue of the Cananea Consolidated Copper Co., S. A., which is registered and protocolized in Mexico.

The Cananea Mountains show marked evidence of strong volcanic action, in the remote past. The mines of the Greene are found in a succession of approximately parallel outcrops of altered limestone, alternating with porphyritic dikes, the ore deposits, often of monstrous size, occurring in shear-zones between the limestone and porphyry, and as replacements in the latter. The ore bodies are entirely distinct and vary greatly, affording practically every variety of oxide, carbonate and sulphide ore, with con-

siderable native copper. Many of the ore bodies are silicious, requiring concentration to eliminate the silica, occurring as quartz, and also as aluminum silicate. None of the ore carries zinc or other refractory elements, and the process of concentration is comparatively simple. There are large gossan outcrops, but appearances are sometimes deceptive, and much of what appears gossan at a distance proves, upon closer inspection, merely weathered conglomerate, showing reddish-brown stains closely simulating the iron colors.

The mines of the Greene have about 30 miles of workings, and the ore in sight is about 4 years' supply, at the present rate of production. The mines of the Capote and Oversight zone alone contain probably 40,000,000 tons of ore, of commercial grade. The mines consume yearly, for timbering, about 40,000,000' of Oregon pine and fir, but it is hoped to secure pine from the Sierra Madre Mountains, at a great saving from present costs, which are high. Ore extraction is by shafts and tunnels, the latter being used wherever possible, as giving cheaper mining costs. The caving system of mining, used at some Lake Superior iron ore mines, is to be given a test. The main working tunnels are double-tracked and electric-lighted throughout, and electric haulage is employed extensively.

The mineral holdings of the Greene are divided into five zones, known as the Cobre Grande, Veta Grande, Esperanza, Capote and Puertecitos, each including a number of different mines. The Cobre Grande and Puertecitos are practically idle, principal production coming from the Capote, Veta Grande and Esperanza zones, in about the order named. The mines are a network of shafts and tunnels, with eight main working shafts, and as many main tunnels.

The Cobre Grande, which was the original mine of the Greene Consolidated, was worked in a crude way, for many years, by the Pesqueira family, but is now the least important of the series. This zone shows concentrating ores only, and while the mine has more than a mile of underground workings, production is small, as its ores, though by no means to be despised, are inferior in grade to those found elsewhere in greater profusion, and more readily accessible.

The Veta Grande has two enormous ore bodies. The Veta Grande proper has a pitch of 36°, with an average width of 218', average length of 726' and known depth of circa 1,000', containing at least 7,000,000 tons of high-grade ore, and probably a considerably larger tonnage. The Massey ore body, opened 1904, has been opened for 450' width, and 1,200' length, and is of unknown depth, this ore body assaying 7% and better in copper, with gold and silver values of about \$2 per ton. The Massey ore body was opened at a point where an expert, who examined the mine, had placed a mythical "zone of impoverishment." The Veta Grande ore is mainly soft chalcocite, with a gangue of talc and occasional massive quartz, carrying large quantities of native copper and a small amount of iron pyrites, with a little massive chalcocite. Extraction is principally through an 869' double-track tunnel, but the new Veta Grande tunnel No.

9, of 6,236' length, serves both the Veta Grande and Oversight mines, connecting with the Capote tunnel, and accommodating 10-ton electric trams. In addition to the main ore body previously referred to, there is a 150' ore body on the hanging wall, ranging 3% to 6% in tenor, the silicious portions of which are used for converter linings. This mine is timbered with square sets, and worked-out stopes are filled in with waste. The ore is mined in 100' sections, leaving 100' slices unmined, and as the worked-out stopes are filled in, it will be possible to mine out the untouched portions when the first sections are exhausted, unless the surface should be stripped previously. The Veta Grande ore bodies are overlaid by a heavy felsite capping, estimated to contain 830,000 cubic yards, and the management has given consideration to the advisability of stripping off this surface rock. Veta Grande shaft No. 5 has three compartments, operating two hoists in balance, with a 115-h. p. double hoist good for a 1,000' depth. This shaft has a 7-drill air-compressor, smithy, timber-framing shops, etc.

The Oversight mine, served by the previously mentioned Veta Grande tunnel No. 9, has large ore bodies of excellent average grade, ranging up to 25% in copper tenor, with increased values shown on the bottom level.

The Capote zone, including a number of mines, is the principal producer of the Greene Consolidated, and is very extensively opened. The four main shafts are known as Nos. 2, 4, 6 and 8, the deepest being about 900', but, like the other mines, the Capotes produce principally through tunnels. The ore is rather peculiar in nature, consisting essentially of iron pyrites with a coating of chalcocite in the form of extremely thin films, the copper-coated iron pyrites occurring in thin crystalline grains, scattered quite uniformly through immense bodies of talc. The Capote ore is highly silicious, and requires careful concentration to secure the best smelting results. The main working level of the Capote zone has a double-track tunnel, connecting shafts Nos. 2, 4, 5 and 7, at an extreme distance of 2,900'. The Capote ore body has a minimum width of 165' and a maximum width of 225', and is estimated by the company to show 11,000,000 tons of ore, which is a conservative figure. No. 2 shaft has a 110-h. p. hoist and No. 4 has a powerful double hoist, good for a depth of 3,000', also a 7-drill air-compressor and a 50-kw. direct-connected generator, furnishing light and power for the Capote workings. No. 10 Capote has a Prescott pump of 1,250,000 gallons daily capacity. The bottom levels are showing very well indeed, both as to quantity and quality of ore, and the mine shows richer in the "zone of impoverishment" than above.

The Elisa mine, 1,500' south of No. 2 Capote shaft, produces a silicious chalcopyrite, rich in gold and silver. On the second level of the Elisa the vein is about 20' wide, for a distance of some 500', and averages 4% to 6% copper, while on the third level the vein has about the same width and carries 8% to 10% copper. The main shaft at the Elisa is 540' in depth.

The Esperanza zone, as yet but slightly developed, is known to carry good ore bodies, and probably will be worked from the Capote shafts, at a depth of 500' to 600'.

The Puertecitos zone, the westernmost of the group, is about 4 miles northwest of the Elisa shaft of the Capote, and is the largest ore deposit yet developed by the Greene. The ore body is of immense size, having an outcrop nearly 800' wide. The upper workings show considerable malachite, azurite, and occasional cuprite and native copper, but the principal values, at a little depth, are in chalcopyrite, with occasional bornite, in a lime-alumina-garnet gangue. The workings of the Puertecitos zone are known as the Ventura, on the east, Juárez, 1,200' next west, and Elenita, 900' west of the Juárez. The deepest shaft is the 700' Ventura, and the Elenita has exposed very rich ores, in grading for surface structures. These shafts have developed ore sufficient to render each in itself a large mine.

The main power plant, near the smelter, has a 65x245' engine-house and a 46x216' boiler-house, both of steel, with iron sides and roof, the boiler-house having 3,500-ton coal-bunkers. The power plant has 3 engines, with direct-connected 100-kw. dynamos, and one 200-kw. direct-connected dynamo, giving a total of about 700 h. p. This plant furnishes a 250-volt current to operate the various shops, briquetting plant, silica-mill, electric cranes, etc., and also furnishes light for all mine buildings and for the towns of La Cananea and Ronquillo. The steel-frame machine shop is equipped with modern machinery, and is supplemented by a foundry having a 2-ton casting cupola. The carpenter shop and planing-mill have a complete sash-and-door equipment, and all necessary woodworking machines and tools. The warehouses are large and carry heavy stocks. Pneumatic tools are used extensively, power being furnished by Rand air-compressors.

The concentrators are on a hillside, between the mines and smelter. The old concentrator is in two independent sections, of 300 tons daily capacity each, and all material is handled by gravity, after being dumped into bins from narrow-gauge cars. The building has 3,400 sq. ft. of floor surface, and for each section the equipment includes one set of 36x14" Davis rolls, 2 sets of 27x14" Allis-Chalmers rolls, two 18" bucket elevators, 10 trommels, four 36" single Hartz jigs, two 36" double Hartz jigs, 22 concentrating tables, 4 slime tables, 18 Frue vanners, and 3 Bryan mills for regrinding. The material is treated by wet crushing and water concentration, and much of the silicious concentrate must be briquetted before smelting. The old concentrator power-house has four 100-h. p. boilers and a tandem compound 250-h. p. condensing engine, with a 300-ton coal-bin and 200,000-gallon water-storage tanks, the concentrator using about 200 gallons of water per ton of ore. The new concentrator, designed and built by Dr. L. D. Ricketts, at a cost of about \$250,000, is terraced throughout, and is in four 500-ton sections. The new mills are of steel frame, with iron sides and roofs. Foundations for all machines are concrete, on rock base, independent of the wooden floors. The new mills have 2,000-ton ore-bins, and the new plant has a separate crusher building, from which the crushed ore is carried in a 36" belt conveyor to the concentrators, native copper and chalcocite being hand-picked from the belt in transit. The new plant has 72 Frue vanners and 80 Wilfley tables, and, owing to scant water

supply, water from the coarse jigs is sent to the jig floor and used upon the middlings, and water from the middlings is used upon the sands and thence back to the coarse jigs again. From the Wilfleys the water goes to thickeners, and from the tailings the water is recovered in settling tanks, the percentage of water recovered by this ingenious combination of economies being 87.5%, which means that every gallon does duty eight times. The new concentrator puts about 3.6 tons into one, and all material is handled automatically, from the time when dumped into the bins until the concentrates are drawn off into the ore cars. Capacity of the combined concentrators, at end of 1905, was 2,400 tons of crude ore daily.

The 33x296' furnace building, of steel frame, with iron sides and roof, has 4,200-ton ore bins and 3,000-ton coke bins. All material is handled by gravity, as far as possible. The smelter has eight Mitchell economic hot-blast air-jacketed furnaces, one of 42x120", one of 42x180", two of 42x210", one of 48x120", and three of 54x160" at the tuyeres. Over each furnace is a 20x20x20' steel dust-chamber, planned to collect flue-dust and return it to the smelting zone of the furnace, by gravity, but unfortunately this plan failed to work according to theory. Leaving these primary individual dust-chambers, the furnace gases go to a main dust-chamber 250x250' in size, through a dust-flue of 10x13x400'. Smoke and gases are discharged from the main dust-chamber through a self-supporting steel stack, 16' 6" in diameter and 190' high. Each blast-furnace has a 30-ton detached settler, which gives a continuous overflow into self-dumping slag-cars, of which there are 22, of 30 to 52 cubic feet capacity each, drawn by two 25-h. p. and two 40-h. p. electric locomotives.

A reverberatory furnace was added in 1905. This is the second largest in the world, having a 20x100' hearth, with over-all dimensions of 27x120'. Its normal capacity is 350 tons of roasted ore daily, and its waste gases are burned under adjoining boilers, furnishing about 700 horse power.

Matte from the blast-furnaces is drawn off into ladles, and taken by electric cranes to the converter building, which is 60x396', of steel frame, with iron sides and roof, having two electric cranes with double auxiliary hoists, of 40' and 50' span, each with a clear hoist of 40' to the main blocks. The capacity of the conversion plant is 8,000,000 lbs. per month. There are 6 stands of converters, with 22 shells, 11' in diameter by 13' length, made of 1" steel plate. The hydraulic cylinders are 24" in diameter, with a water pressure of 200 lbs. to the square inch, and can rotate the shells through a radius of 270°. The converters blow off into movable hoods, leading to primary and secondary dust-chambers for gases. A railroad track runs under each converter stand, and the casting-cars are fitted with six 300-lb. ingot moulds each, there being 24 cars and 250 moulds. After casting, the ingots are carried in the cars to the bullion floor, where the pigs are chipped, weighed, sampled and loaded, all sampling being done by electric drills. The converter-slags are taken back in ladles, by crane, to the forehearth, thus saving resmelting. Blast for the converters is supplied by three engines, with

an aggregate of 1,700-h. p. and capacity to compress 29,750 cubic feet of free air, per minute, to a pressure of 15 lbs. per square inch.

At the eastern end of the converter building is the lining department, with silica-mill, pneumatic rammers, etc. All raw material is handled by gravity, from 600-ton silica bins. The silica mill has one 10x20" Blake crusher, two 26x15" Argall rolls, one 8' automatic mixing-pan, conveyors, elevators, etc., and takes power from a 125-h. p. electric motor. For linings, low-grade silicious ores have displaced barren silica.

In the engine-house of the smelter are 3 blowing engines, one a 225-h. p. Nordberg, with 13x24" steam cylinders and 57x57x42" air cylinders, with capacity to reduce 20,000 cubic feet of free air per minute, and two Murray-Corliss tandem-compound blowing engines, of 125 and 375 h.p., also 3 smaller blowers, giving a total capacity of 1,100 h. p. and 92,500 cubic feet of free air per minute, compressed to a pressure of 2½ lbs. per sq. inch. The boilers have an aggregate capacity of 3,000 h. p., and there is a 12" main steam-line into the boiler-room. Coal is fed by gravity from bins. The water-storage tanks at the smelter have a capacity of 596,000 gallons, with 9,300' of water-mains and 4,000 of 2½" fire-hose.

Much of the ore smelted being pulverulent, an excessive quantity of flue-dust is produced, this requiring briquetting before resmelting. The briquetting plant has a 225-ton Mould plunger press and a 100-ton White mineral press, briquettes being sent by belt-conveyors to the charging-floor of the smelter. Owing to the immense amount of material requiring briquetting, a large number of men are employed on handwork, and it is planned to erect a new briquetting plant, to have a daily capacity of 400 tons.

A sampling mill, built 1905, is of steel, with steel ore-bins and belt-conveyers. A 206x450' ore-bedding plant, of steel, also built 1905, at a cost of about \$200,000, has 30,000 tons capacity. A series of belt-conveyors distribute ores by grades, and from the bedding plant the ores go automatically to the furnaces. The new system effects a saving in smelting costs, estimated at 30 cents per ton.

Product of the smelter is auriferous and argentiferous blister copper, which is refined electrolytically by the Nichols Chemical Co., of New York, with which company the Greene has a long term contract for electrolytic refining, at the favorable rate of \$15 per ton. The copper of the Greene is sold by the American Metal Co., Ltd.

The mines and works are connected by about 30 miles of wagon-road, having a maximum gradient of 7%, and there also are about 25 miles of trails. The company owns upwards of 400 horses, mules and burros, and has a large corral for their care.

The mines and works are connected by an 11-mile 36" gauge private railroad, laid with 35-lb. and 45-lb. steel rails, and equipped with two 28-ton Porter, one 38-ton and one 40-ton Baldwin locomotives, with ten 25-ton and twelve 30-ton steel ore-cars, 3 coke cars, 4 flat-cars, 2 box-cars and a caboose. This railroad was excessively crooked, and had some 5% grades,

consequently the locomotives could haul but three loaded cars, until rebuilt throughout, with much easier grades and curves, doubling the hauling capacity of each engine. The narrow-gauge line was double-tracked, 1905, between the Capote mine and the smelter. Railroad connection with the outside world is over the Ferrocarril Cananea, Rio Yaqui y Pacifico, built by the company and sold to the Southern Pacific, a 25-year freight contract, made at the time of the sale, assuring favorable freight rates. A 90-day fuel supply is carried, to guard against shortage caused by strikes, floods, and other contingencies.

Potable water is piped from Sawmill Cañon, and water for the concentrators, boilers and other uses, is secured from a pumping plant at Ojo de Agua, on the headwaters of the Sonora river, $9\frac{3}{4}$ miles from the mine. The pumps have capacity to force 1,750,000 gallons daily through a 10" steel pipe-line, against a head of 967', to a reservoir on the hills above Ronquillo, whence water is delivered to the mine, reduction plant and towns, under a substantial working pressure. The water system of the company has about 25 miles of mains, ranging in size from 2" to 10", and owing to the cost of securing water, it is clarified and re-used, wherever possible.

The Greene owns 5 office buildings, 11 dwellings for foremen, boarding houses with capacity to care for 900 men, 6 lodging houses and about 200 cabins for miners. There are 3 boarding-houses of 10 rooms each, 1 of 16 rooms, and 1 of 42 rooms, all of brick. The company also owns a restaurant, bakery, meat-market, etc., and maintains a scavenger service in the municipality of Ronquillo. There is a two-story brick hospital, 40x100', with detached kitchen and beds for 50 patients, also a 6-ward emergency hospital at Chivatera, and a fine club-house for employees. The mercantile plant includes a brick store, carrying an immense stock, with warehouses having direct railroad connection, and a branch store at Chivatera. The retail mercantile business of the Greene aggregates nearly \$4,000,000 yearly. The company also owns and operates the Banco de Cananea, organized January, 1902, with a capital of \$200,000, Mexican, which does a large and highly profitable business, Ignacio Macmanus being cashier. There is a brickyard with a daily capacity of 35,000 brick, and the company maintains a telephone system having about 200 miles of wire and about 150 phones, also an independent telephone system used for dispatching on the narrow-gauge railway. There are two sawmills, with a combined daily capacity of 14,000 feet, cutting lumber from the company's timber lands. A concession for a power plant, on the Yaqui river, has been secured from the Mexican government, and the installation of a large electric plant is under consideration.

The mines and smelter employ upwards of 4,000 men, about 85% of whom are Mexicans, with several hundred American skilled workmen, and about 300 Chinese. Wages average \$3.50 to \$4 gold per day for Americans, and about \$3 silver per day for Mexican miners, this being the highest wages paid native workmen by any Mexican mine. A "race-war," occurring in May, 1906, was much exaggerated in the press, though sufficiently serious.

The rioting, which was speedily quelled by Gov. Ysabal, of the state of Sonora, with the able assistance of Col. Emilio Kosterlitzky, of the *gendarmeria fiscal*, was caused by professional agitators and would-be revolutionists, who selected La Cananea for their efforts, because of its proximity to the American border—and safety—the Mexican government having a way of promptly shooting rioters and revolutionists first, and trying them later on, when time hangs heavy.

The Greene Consolidated Copper Co., and its president, Col. Wm. C. Greene, have been the targets for more lies than ever before have been directed at any mining company. The campaign of slander was conducted systematically, for nearly 5 years, but was broken by the confession of a treacherous director, who admitted his guilt, and that he had been made a cat paw. The management of the Greene is human, and has made mistakes, but the deliberate attempts to ruin the company, and destroy the reputation of its founder, have reacted upon the assailants, creating sympathy for the property and management so wantonly and untruthfully assailed. The Greene Consolidated, located in what was a wilderness in 1898, but is a city of 23,000 souls in 1906, was created in double-quick time. Mistakes were made, but financial conditions were such that haste—which means waste—was unavoidable. The errors have been repaired, in the main, and those that remain are being made right by the present capable management. It would have been better had dividends been begun several years later than was the case, but the explanation is not far to seek. Fighting for the financial lives of his company and himself, Col. Greene was forced to begin paying dividends from funds that better could have been put back into the mine and its equipment. An enterprise so vast as the Greene absorbs money as a sponge sucks up water, hence the various increases of capital.

In the fiscal year 1905, production was 64,211,895 lbs. fine copper, made at a cost of about 11 cents per pound, and production will show little change for 1906. The combined capacity of the concentrator and smelter is about 4,000 tons of raw ore daily. The policy of treating lower grade ores has brought the average tenor of ore treated, from 5.73% in 1903, and 4.98% in 1904, down to 3.84% in 1905.

GREENE GOLD-SILVER CO.

MEXICO.

Office: 24 Broad St., New York. Mine office: Temosáchic, Chihuahua, Mexico. Col. Wm. C. Greene, president; Mark L. Sperry, vice-president; E. J. Gates, treasurer; Richard A. Jones, secretary; John H. Martin, assistant secretary and treasurer; Frank Klepetko, consulting engineer; C. C. Chase, general mine superintendent; W. E. Pomeroy, Edward Massey, N. J. Welch, Foster Kipp, S. N. Dedrick, Sam King and G. M. Hillary, superintendents of various mines; New York Trust Co., registrar; North American Trust Co., transfer agent. Organized November 10, 1902, under laws of West Virginia, with capitalization \$15,000,000, increased, March, 1906, to \$25,000,000, shares \$10 par, in \$3,000,000 preferred 8% stock and \$22,000,000 common stock.

Landed holdings are among the most extensive possessed by any mining company in the world, including a government concession to locate mines in an area of upwards of 4,000 square miles, in the states of Chihuahua and Sonora, Mexico. Company holds a large number of developed and partly developed gold, silver, copper and lead mines, including the Guaynopita, Santa Juliana, Balvanera, Mulatos, Veta Grande, Cerro Boluda and numerous other mines, located at Temosáchic, Mulatos, Trinidad, Colón, Santa Juliana, Belén, San Refugio, Santa Brigida, Natividad and elsewhere, in the states of Chihuahua and Sonora, giving a chain of properties from El Paso to the Pacific. Properties controlled by this company have produced upwards of \$120,000,000, mainly from surface workings. There are 11 different reduction plants on 11 different properties, and new plants of a more modern nature are planned, and under construction.

Holdings in the Jesús María district, Ocampo, Chihuahua, include the Santa Juliana, Balvanera, Guadalupe, Rincón and Ronquillo groups. The Santa Juliana has produced upwards of \$100,000,000, according to government records, and shows a vein ranging up to 50' width, opened to 900' depth, which is approximately the water-level. The mine has been reopened by a double-track drainage tunnel, which will unwater this and adjacent properties, to a depth of circa 1,500'. Equipment includes an old stamp mill.

The Balvanera, adjoining the Santa Juliana group, in the Canton of Rayón, Chihuahua, has a 40-ton mill and concentrator. This group has produced upwards of \$3,000,000, and includes 44,000 acres of pine and oak timber lands, of good quality, with numerous buildings and various other surface improvements.

The Guaynopita copper mines, located in Guaynopita Cañon, Chihuahua, near the Sonora line, were worked by the Aztecs before the conquest of Mexico. Ores carry good values in gold, silver and copper, and it is planned to erect a 500-ton smelter at this property.

The Mulatos group, in the Sahuaripa district of Sonora, is said to have produced upwards of \$18,000,000, mainly in gold, from arastras and a 60-ton mill now on the property. The vein is of enormous size, ranging up to 500' in width, and the company plans the installation of a 2,500-ton mill. The Mulatos group includes mineral rights to 6,400 acres, also 2,400 acres of timber lands.

Miscellaneous holdings include the Veta Grande gold mines, adjoining the Pinos Altos, and the Cerro Boluda group of gold mines, also a large number of smaller old mines.

In addition to mineral lands, the company possesses extensive tracts underlain by coal of good quality and existing in large quantity. Miscellaneous concessions from the Mexican government allow the free importation of mining material, and exemption from taxation for several years. The company also has concessions for utilizing water power from the Aros and Yaqui rivers, and has concessions for constructing telegraph and telephone lines and other public utilities.

The holdings of this company are so extensive that years will be required to provide for their adequate development. Work now under way includes the construction of wagon-roads to sundry mines, radiating from Temosáchic, which has a railroad. A 300-ton mill has been built at Concheño, Chihuahua, and a 200-ton smelter is planned for the townsite of Dedrick, at the Santa Boluda mines. The management expects to be producing about 1,000 tons of gold ores, averaging \$15 per ton, by 1907, and by that time should be a considerable producer also of silver, lead and copper ores. Management is good, and the property is one of almost infinite possibilities.

GREEN HOPE MINING & MILLING CO.

WYOMING.

Office: Omaha, Neb. Mine office: Guernsey, Laramie Co., Wyo. Lands, sundry claims in the Hartville district. Company is said to have planned erecting a 200-ton smelter, at Guernsey, but no such smelter built. Idle.

GREENHORN COPPER MINING CO.

COLORADO.

Mine office: Cañon City, Fremont Co., Colo. Mrs. Wm. E. Johnson, administratrix, Metropole Hotel, Denver, Colo., is the principal shareholder, and practically manager of the company. Lands, sundry copper claims, 12 miles from Cañon City, on which some development has been secured, showing low-grade copper ores. Presumably idle.

GREEN MONSTER MINE.

CALIFORNIA.

Office: care of D. C. Riddell, owner, Gilroy, Cal. Mine, in Inyo county, California, has a 300' tunnel, showing good copper ore. Idle.

GREEN MONSTER MINE.

NEVADA.

Office: care of Mrs. Phoebe Hearst, owner, San Francisco, Cal. Mine office: Sandy, Lincoln Co., Nev. Frank O. Wilkinson, superintendent. Mine is opened by a 325' two-compartment vertical shaft, showing carbonate and sulphide ores, latter including argentiferous galena and chalcopyrite. Mine has been claimed to show about 5,000 tons of \$40 ore.

GREEN MOUNTAIN COPPER CO.

NEW MEXICO.

Office: 1013-135 Adams St., Chicago, Ills. Mine office: Rinconada, Rio Arriba Co., N. M. Adrian Vanderclout, president; F. E. Roberts, Jr., secretary; T. F. Woody, mine manager. Organized March 18, 1903, under laws of New Mexico, with capitalization \$2,000,000, shares \$1 par; issued, \$1,781,900. Lands, 8 claims, area 180 acres, in the Copper Mountain district, showing two contact veins between slate and quartzite, claimed to average 30' width and to be traceable 4,000', carrying oxide and carbonate ores, giving assays of 4% to 37% copper, from a trace to 800 oz. silver and 80c. gold per ton. Has 13 shafts, deepest 250', also a 210' tunnel and an open-cut, with 758' of underground workings, estimated by management to show 40,000 tons of ore. Nearest railroad, 8 miles. Presumably idle.

GREEN MOUNTAIN COPPER MINING CO.

WYOMING.

Property sold, circa 1904, to Saginaw Valley Copper Mining Co.

GREEN MOUNTAIN MINE.

CALIFORNIA.

Office and mine: Lewis, Mariposa Co., Cal. O. R. Sydney, owner and manager. Mine produced a considerable amount of high-grade oxide and carbonate ores, before closing, 1863, and shows a promising ore body.

GREEN MOUNTAIN MINE.**COLORADO.**

Letter returned unclaimed from former mine office, Parkdale, Colo.

GREEN MOUNTAIN MINE.**MONTANA.**

Owned by Anaconda Copper Mining Co.

GREEN MOUNTAIN MINING & MILLING CO.**COLORADO.**

Office: 519 Frick Bldg., Pittsburg, Pa. Mine office: Silverton, San Juan Co., Colo. Joseph G. Lee, president; S. J. Crawford, secretary; E. W. Walter, general manager; D. Umbell, mine superintendent. Organized under laws of Colorado, with capitalization \$3,000,000. Lands, 19 claims, area circa 200 acres, in Cunningham Gulch, 7 miles from Silverton, opened by tunnels of 600' and 800', with about 4,000' of workings. Ores are auriferous and argentiferous iron-copper-lead sulphides, with quartz gangue, averaging about \$12 per ton in value. Has steam power and 12-drill Rand air-compressor. Has a 200-ton concentrator, connected with the mine by a 4,000' aerial tram.

GREEN MOUNTAIN ST. LOUIS**BRITISH COLUMBIA.****CONSOLIDATED MINE.**

Letter returned unclaimed from former office, 31 Union Square, New York. Mine office: Rossland, Yale district, B. C. W. L. Lawry, president. **COMPANIA MINERA GREGORIA.**

MEXICO.

Letter returned unclaimed from former mine office, Minillas, Zacatecas, Mexico.

GREGORY-BUELL CONSOLIDATED GOLD**COLORADO.****MINING & MILLING CO.**

Mine office: Central City, Gilpin Co., Colo. Property is the Buell mine, carrying gold, silver and copper ores. Has steam power and a 45-stamp mill. **GREYHOUND GROUP.**

IDAHO.

Mine office: Challis, Custer Co., Idaho. Lands, 12 claims, on Keystone Mountain, circa 6 miles from Challis. Idle at last accounts.

GREYTON COPPER MINES CO.**COLORADO**

Office: care of Thos. Potter, secretary, Denver, Colo. Letter returned unclaimed from former mine office, Pearl, Larimer Co., Colo. Organized January, 1902, with capitalization \$75,000, shares 5c. par. W. H. Kistler, president. Lands, 12 claims, near the Colorado and Wyoming line opened by sundry pits and shallow shafts, deepest 70', showing cuprite and copper sulphides. **GRIBBELL ISLAND COPPER CO.**

BRITISH COLUMBIA.

Office: Fairhaven, Wash. Lands, sundry claims, on Gribbell Island, Skeena River division, Cassiar district, British Columbia. Presumably idle.

GRIFFITH CONSOLIDATED MINE.**COLORADO.**

Mine office: Georgetown, Clear Creek Co., Colo. Hood & Maxwell, owners; Will C. Hood, superintendent. Ores carry gold, silver, lead and copper.

GRIGGSTOWN MINE.**NEW JERSEY.**

Letters returned unclaimed from former mine office, Griggstown, Somerset Co., N. J. An old property, reopened for a short time, in 1901.

GRINDALL MINING & SMELTING CO.**ALASKA.**

Office: care of Ed. E. Aegeter, agent, 200 Epler Blk., Seattle, Wash. Letter returned unclaimed from former mine office, Ketchikan, Alaska. T. J. Sweaney, superintendent, at last accounts. Lands, 21 claims, on the Kasaan peninsula, said to have been leased, 1905, to the Alaska Improvement Co. Ores carry values of about \$18 per ton.

FAHLERZBERGBAU GROSS- UND KLEINKOGEL.**AUSTRIA.**

A very old mine, in the Austrian Tyrol. Is a small producer, said to be nearing exhaustion.

GROWLER COPPER CO.**ARIZONA.**

Office: 14 Kilby St., Boston, Mass. Mine office: Gila Bend, Pima Co., Ariz. Henry T. Shaefer, president; Geo. H. Morrill, Jr., vice-president; Herbert Moseley, treasurer. Lands, 20 claims, area 400 acres, in two groups, including the Copper Hill group of 18 claims, also two 5-acre millsites, circa 68 miles west of rail connections at Gila Bend, opened by shafts of 85' and 200' and by a 75' tunnel, said to show a 300' sulphide ore body. Company was said to plan installation of a pyritic smelter, but there is no evidence of same having been ordered.

GUILLERMO GRUNDY.**PERÚ.**

Office and mine: Musquituni, Lampa, Perú. Was a small producer of copper-silver ores, at last accounts.

FUNDICIÓN METALURGICA DE GUADALAJARA, S. A.**MEXICO.**

Office and works: Guadalajara, Jalisco, Mex. Diego Moreno, president; Justo Fernandez del Valle, vice-president; Alberto Zunigo, treasurer; Francisco Gonzalez y Arias, secretary; Luis Altorra, comisario; José S. Diaz, general manager. Capitalization, \$300,000. Has a smelter with a 100-ton lead stack, and plans adding a 100-ton copper furnace.

MINA GUADALUPANA.**MEXICO.**

Mine office: Topia, Durango, Mex. Felix Briones, owner. Ores carry copper and silver.

GUADALUPANO MINING CO.**MEXICO.**

Letter returned unclaimed from former mine office, Torres, Sonora, Mexico. Has silver-lead-copper ores, developed by shaft, with steam power and a 20-stamp mill.

MINA GUADALUPE.**MEXICO.**

Office: care of Vicente Visconti, Santa Rosalia, Chih., Mex. Mine office: Maturana, Parral, Chihuahua, Mex. Property is said to show circa 5,000 tons of copper ore.

MINA GUADALUPE.**MEXICO.**

Mine office: Muleros, Durango, Mex. José B. Nava, owner; R. Romo, manager. Development is by open-cut, on a considerable body of copper ore. Employed circa 60 men, at last accounts.

MINA GUADALUPE.**MEXICO.**

Office and mine: care of John Dee, owner, Autlán, Jalisco, Mex. Lands, 14 pertenencias, 8 miles west of Autlán, showing a "manto", or blanket vein, with hematite capping, underlaid by carbonate copper ores. Is but

slightly developed, but apparently could be worked open-cast, to advantage.
GUANAJUATO COPPER CO. **MEXICO.**

Said to have copper claims in the vicinity of Guanajuato, Mexico, but careful investigation has not located the property.

GUARDIAN COPPER MINING CO. **MONTANA.**

Out of business. Lands sold, 1906, to Butte Coalition Mining Co.

GUAYNOPA SMELTING & REDUCTION CO. **MEXICO.**

Merged, 1904, in International Consolidated Smelting & Mining Co.

GUAYNOPITA COPPER CO. **MEXICO.**

Entire stock issue owned by Greene Gold-Silver Co.

GUERRERO DEVELOPMENT CO. **MEXICO.**

Office: care of A. H. Ten Broeck, secretary and treasurer, San Francisco, Cal. Mine office: Chilpancingo, Guerrero, Mex. W. R. Price, president; J. J. Moylan, vice-president; J. S. Cannon, general manager; E. J. Reynolds, superintendent. Is developing by a tunnel, on the Veta Madre, above Chilpancingo.

GUGGENHEIM EXPLORATION CO. **U. S. A. & MEXICO.**

Controlled by American Smelters Securities Co.

GULF CREEK, LTD. **AUSTRALIA.**

Voluntarily liquidated, November, 1904.

GULF CREEK MINE. **AUSTRALIA.**

Mine office: Barraba, N. S. W., Australia. Lands, 250 acres, in the Gulf Creek district of the Barraba division, 350 miles north of Sydney and 72 miles from a railroad. Ore bodies include a 9' vein of 7% sulphide ore, also a 10% lense of sulphide ore 25' wide and 350' long. Ore is very heating, being rich in sulphur. Country rocks are indurated clay-slates, of Carboniferous age, with dikes of serpentine. Has steam power and a 300-ton smelter. Production, 1901, was 560 long tons fine copper, from 9,400 tons of ore smelted. Idle.

GUM TREE GOLD MINING & MILLING CO. **COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. F. Antisdale, superintendent, at last accounts. Ores carry gold, silver lead and copper. Has steam power.

GUNN'S PEAK COPPER MINING CO. **WASHINGTON.**

Office: 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A. M. Watt, superintendent. Lands, 4 claims, showing 3 veins, widest said to be 25', carrying chalcopryite and bornite, said to give average assays of 11% copper and circa 2 oz. silver per ton. Has tunnels of 125' and 800', and was developing actively, early in 1906.

GUNSIGHT GROUP. **ARIZONA.**

Sundry undeveloped claims, lying near the Crescent property, in Tombstone Cañon, north of Bisbee, Cochise county, Arizona.

GWIN MINE DEVELOPMENT CO. **CALIFORNIA.**

Mine office: Gwinmine, Calaveras Co., Cal. David McClure, superintendent. Is a gold mine, but possesses also a large body of undeveloped copper ore, of low grade. Paid a 25c. dividend, February, 1906, being the

first in 2 years, and is said to be producing at rate of about \$500,000 yearly.

GWYNANT COPPER MINES CO., LTD.

Dissolved, January, 1905.

GYMPIE COPPER MINES, LTD.

AUSTRALIA.

Voluntarily liquidated, May, 1904.

HADLEY CONSOLIDATED COPPER CO.

ALASKA.

Office: 609 Mutual Life Bldg., Seattle, Wash. Mine office: Hadley, Prince of Wales Island, Alaska. Employs 30 men. Samuel I. Silverman, president; B. E. Barinds, vice-president and treasurer; Nelson W. Parker, secretary; preceding officers, W. S. Grinsfelder, Alex. Reith and Geo. Browne, directors; Geo. E. Green, superintendent; Robt. Pollock, mine superintendent. Organized circa 1904, as successor of Wales Copper Mining Co., with capitalization \$5,000,000, shares \$1 par, in \$1,500,000 preferred and \$3,500,000 common stock. Paid a dividend of 1 cent per share, on preferred stock, amounting to \$15,000, on December 10, 1905, and a similar dividend, January, 1906, ending 1905 with a cash balance of \$18,846.

Lands, 12 claims, partly patented, area circa 200 acres, on Mount Andrew. The principal property, known as the Stevenson mine, has a very large ore body, claimed to be 250' wide and 600' long, developed by 555' of tunnels and 3 glory-holes, and is said to have 58,500 tons of ore blocked out for breaking. Smelter shipments, 1905, gave returns of 3.7% copper, 20 cents silver and \$1 gold per ton. Ore carries 32% iron and is practically self-fluxing. Mine is connected with the smelter of the Alaska Smelting & Refining Co., at Hadley, circa 2 miles distant, by railway and aerial tram. Production, 9,439 tons, in 1905, gave returns of \$55,923, with 698,486 lbs. fine copper. At beginning of 1906 company was shipping 100 tons daily, and earning a profit of about \$6 per ton therefrom. Management seems conservative and capable, and property is considered valuable.

HAGGARTY COPPER MINING CO.

WYOMING.

Controlled, through stock ownership, by Penn-Wyoming Copper Co.

HAGGARTY-JORDAN COPPER MINING CO.

WYOMING.

Office: Watertown, N. Y. Mine office: Battle, Carbon Co., Wyo. C. H. Dunbar, president; Delos S. Dunbar, secretary and treasurer. Organized 1901, under laws of Delaware, with capitalization \$150,000, shares 10c. par. Lands, 11 claims, area 220 acres, in the Battle Lake district, showing 4 fissure veins, of which two, very slightly developed, are claimed, untruthfully, by the management, to carry carbonate and sulphide ores with average values of 35% copper, a trace of silver and \$5 gold per ton. Company suffered a mysterious "burglary," by which all its books and papers were stolen. Moribund, and should be decently interred.

HAGUE & HULBERT EXPLORATION.

MICHIGAN.

Office: care of Jas. D. Hague, 18 Wall St., New York. Lands, 240 acres, in Sections 25 and 26, Town 50 North, Range 33 West, bought, 1905, of the Sheldon Estate and the C. C. Douglas Co. It is probable that additional lands will be acquired, and exploratory work begun.

HALIFAX COPPER CO.**VIRGINIA.**

Office and mine: Virgilina, Halifax Co., Va. Property is the Wall mine, which shipped a little ore, 1900. Idle at last accounts.

HALLIWELL COPPER CO.**MICHIGAN.**

Office: Society for Savings Bldg., Cleveland, Ohio. Mine office: Ontonagon, Ontonagon Co., Mich. Idle. A. H. Weed, president; John Becker, vice-president; Chas. W. Voth, secretary; C. F. Uhl, treasurer. Organized January, 1895, under laws of West Virginia, and reorganized, 1901, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par; bonds, \$6,500 issued. Lands, 880 acres, owned in fee, in Carp Lake township, carrying sundry copper bearing amygdaloids, with shafts of 130' and 190', and tunnels of 190' and 200'. Has a 60-h. p. steam plant, with hoist and 3-drill air-compressor. Buildings include a machine shop, shafthouse, rockhouse, smithy and sawmill.

HALL MINING & SMELTING CO., LTD.**BRITISH COLUMBIA.**

Offices: 1, Leadenhall St., London, E. C., Eng. Mine office: Nelson, B. C. Employs 125 men. Lord Ernest W. Hamilton, chairman; C. Harvey, consulting engineer; A. E. Ashley, secretary; J. J. Campbell, business manager; M. S. Davis, mine superintendent. Organized June 6, 1900, as a reconstruction of Hall Mines, Ltd., with capitalization £325,000, shares £1 par; issued, £275,000. Debentures, £50,000 authorized; issued, £24,560, first mortgage 6% bonds, redeemable at 105, on 6 months' notice, at option of company. Lands, 18 claims, area 506 acres, also a 40-acre smelter-site, on Toad Mountain, including the Silver King, Hall and Highland mines, also a quarter interest in the Emma mine, near Summit. Mines produce auriferous and cupriferous silver-lead ores, the Silver King carrying bornite above and argentiferous tetrahedrite below, the lower levels not looking so well as the upper workings.

The Silver King, down to the seventh level, and two other properties, are leased to M. S. Davys, on royalty, until June 30, 1907. Ore produced is mainly silver-lead, with a little copper.

The reduction plant, near the mine, includes sampling mill, laboratory and smelter, latter having one large and one small furnace, originally built for copper, but now used mainly for lead matting. The smelter has hand and mechanical roasters. Production, for fiscal year ending June 30, 1905, was 26,505 tons of ore, of which 17,257 tons were smelted in the company's own furnace, and the balance sent to other smelters. Latest reported figures of copper production were 318,124 lbs., for fiscal year 1904.

CLEMENTE HAM.**MEXICO.**

Mine office: Promontorios, Alamos, Sonora, Mex. Is a producer of copper ores, which are smelted to matte near the mine. Production, 1902, was 191.2 metric tons matte, presumably averaging about 55% in copper tenor.

HAMILTON MINING CO.**MICHIGAN.**

Wound up. Lands sold to Copper Crown Mining Co. of Michigan.

HAMILTON MINING, MILLING & TRANSPORTATION CO.**COLORADO.**

Mine office: Winfield, Chaffee Co., Colo. John G. Paine, superintendent,

at last accounts. Ores carry copper, silver and gold, and are developed by shaft and tunnels.

HAMLEY COPPER MINE.**AUSTRALIA.**

Office: care of John S. Scott, secretary, Grenfell St., Adelaide, South Australia. Mine office: Moonta, Yorke Peninsula, South Australia. Mine, opened 1861, under name of Karkarilla, shows 6 parallel veins, of 3' average width, carrying mainly bornite and chalcopyrite, with occasional chalcocite, ores averaging about 3.8% copper. Deepest shaft is 1,020'. Production, 1904, was circa 500,000 lbs. fine copper.

HAMMOND COPPER CO.**MONTANA.**

Letter returned unclaimed from former office, 18 Broadway, New York. Lyman M. Loomis, president and treasurer; Joseph Howard, secretary. Last heard of company was a charge of fraud, preferred against officers by a Baltimore shareholder, in 1902. Presumably dead.

HAMPDEN CLONCURRY COPPER MINES, LTD.**AUSTRALIA.**

Mine office: Cloncurry, North Queensland, Australia. Organized 1906. Mines include the Hampden, which shows large sulphide ore bodies, and from which 528 long tons of selected ore, shipped, 1901, to the Wallaroo smelter, gave returns of 36.5% copper. Mines are hampered by lack of rail transportation, or smelter in the vicinity, but property is considered promising.

HAMPDEN COPPER MINES.**AUSTRALIA.**

Succeeded, 1906, by Hampden Cloncurry Copper Mines, Ltd.

HAMPTON MINE.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. W. C. Hughes, manager, at last accounts. Ores carry gold, silver and copper. Has steam power.

HANAWA MINE.**JAPAN.**

Owned by Mitsu Bishi Gosshi Kwaisha.

HANCOCK CONSOLIDATED MINING CO.**MICHIGAN.**

Mine office: Hancock, Houghton Co., Mich. John D. Cuddihy, president; Thos. Hoatson, vice-president; preceding officers, Jas. Hoatson, S. B. Harris and Allen F. Rees, directors; John H. Hicok, secretary and treasurer; John L. Harris, superintendent. Capitalization \$5,000,000, shares \$25 par, of which it is planned to issue 100,000 shares at \$10, and pay \$500,000 for property, leaving \$500,000 in the treasury for development purposes. Lands, 860 acres, including the old Hancock mine, area 140 acres, the Condon tract of 120 acres, and 600 acres secured from St. Mary's Mineral Land Co. These tracts carry the Hancock or Sumner lode, the Quincy "west vein" and the Pewabic lode, all amygdaloidal cupriferous beds. Several millsites are under consideration.

The old Hancock mine, operated 1861-1885, produced 2,854 tons, 1,384 lbs. fine copper. Development is by a shaft of 1,052' and an old air-shaft. It is planned to cut the main shaft down to 3-compartment size and add a modern mining equipment. The Hancock lode averages circa 12' width, and gave average returns, when worked, of 21 lbs. fine copper per ton. During its latter years of activity, the monthly mineral product was about 50

tons, secured from an average daily production of 210 tons of rock. The best part of the Quincy mine is tributary to No. 7 shaft, which adjoins the Hancock boundary. The Quincy Mining Co. claims the right to mine the Pewabic lode on the lands of the old Hancock Mining Co., and the latter claims that the Quincy has done considerable unauthorized mining on its lands. There is a possibility that the Hancock Consolidated Mining Co. may be merged with the Quincy Mining Co., failing which, it is almost certain that there will be prolonged litigation over mining rights, between these two corporations. The management of the Hancock Consolidated is strong and capable, and prospects of the company are considered good.

HANCOCK COPPER MINES OF IDAHO, LTD.**IDAHO.**

Office: care of John Sennett, treasurer, Washington, D. C. Mine office: Landore, Washington Co., Idaho. C. F. Drake, president and general manager; J. J. Curtis, vice-president; Geo. A. Rahm, secretary. Organized 1905, with capitalization \$1,000,000. Lands, 10 claims, on Camp Creek, 2 miles from Landore, developed by a tunnel, said to show considerable bodies of auriferous copper ore. Company is said to plan experimenting with a newly patented reduction process.

HANCOCK MINES CO.**NEW MEXICO.**

Letter returned unclaimed from former office, St. Louis, Mo.

HANCOCK MINING CO.**MICHIGAN.**

Succeeded, 1906, by Hancock Consolidated Mining Co.

HANE COPPER MINING CO.**MONTANA.**

Letter returned unclaimed from former office, Butte, Montana.

HANOVER COPPER CO.**NEW MEXICO.**

Office: 1502-11 Broadway, New York. Charles W. White, president and treasurer; R. K. Wartman, secretary. Organized under laws of South Dakota, with capitalization \$1,000,000, shares \$100 par. Company expended about \$75,000 on development of mining claims near Hanover, Grant county, New Mexico, but work was done under inexperienced management, and company allowed title to lapse, through non-payment of balance due on bond, meanwhile securing sundry other claims, presumably in same neighborhood, on which no mining has been done as yet.

HANOVER MINE.**NEW MEXICO.**

Office: Hanover, Grant Co., N. M. Robert Musgrove, superintendent. Is being worked, with a force of about 25 men, by Phelps, Dodge & Co., ores produced from old workings being shipped to the Copper Queen smelter, at Douglas, Arizona.

HANOVER MINING CO.**MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. F. H. Raymond, president; C. O. Burbank, secretary and treasurer. Lands, 320 acres, being the West $\frac{1}{2}$ of Section 8, Town 58 North, Range 28 West, Keweenaw county, Michigan. Never a producer, and idle for many years.

HANOVER MINING & MILLING CO.**NEW MEXICO.**

Letter returned unclaimed from former office, Albuquerque, N. M. Mine office: Hanover, Grant Co., N. M. J. W. Bible, manager.

HAPPY JACK MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. H. Barnett, superintendent, at last accounts. Mine is opened by shaft and tunnel, showing ores carrying gold, silver, copper and lead values. Presumably idle.

HAPPY JOHN MINE.**BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. Property adjoins the Monitor mine, on the west, and is said to have a promising ore body carrying gold, silver and copper values. Did 175' of tunneling, 1904.

HARDSCRABBLE MINES.**NEW MEXICO.**

Office and mine: Magdalena, Socorro Co., N. M. W. A. Brown, lessee. Property shows 9 veins, occurring as fissures in granite and as contacts between granite and limestone, these being claimed to average about 25' width, and to carry chalcopryrite, sphalerite and cerussite averaging about 4% copper, 30% lead, 44% zinc, 12 oz. silver and \$1 gold per ton. Mines have a 200' shaft and several tunnels, longest 200' and 300'.

HARLEY GOLD MOUNTAIN MINING & SMELTING CO.**WASHINGTON.**

Office 704 New York Blk., Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. Employs 15 men. Charles Burns, president and treasurer; Harley E. Burns, vice-president; Henry S. Noon, secretary; K. O. Neste, general manager. Organized December 15, 1900, under laws of Washington, with capitalization \$2,500,000; issued, \$1,500,000. Lands, 16 claims, area 300 acres, in the White Horse district, showing 12 ore bodies, occurring as fissures in porphyry and as contact veins between granite and porphyry. Four veins are under development, these being said to average 6' width and to carry 14.5% copper, 8 oz. silver and \$25.65 gold per ton. Development is by tunnel, with 346' of openings. Company plans adding a steam plant, during 1906.

OTTO HARNECKER.**CHILE.**

Office and mine: La Ligua, Aconcagua, Chile. Operates the Peña Blanca mine, opened 1888. Has a small matting furnace and produces matte carrying about 350,000 lbs. fine copper yearly.

HARRINGTON MINING CO.**ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. Geo. P. Harrington, general manager. Property is the Tiger mine, carrying ores of gold, silver and copper. Has steam power. Presumably idle.

HARTFORD CONSOLIDATED COPPER CO.**CALIFORNIA.**

Lands, 10 claims, 3 miles north of Protem Creek, Shasta county, California, carrying an 8' vein, showing surface oxidized ores with a limited quantity of disseminated sulphides below, opened by 400' of tunnels. Idle.

HARTFORD COPPER & GOLD MINING CO.**ALASKA & IDAHO.**

Office: 7 Exchange Pl., Boston, Mass. Mine office: Challis, Custer Co., Idaho. Henry J. Wilkins, president; Chas. M. Thayer, secretary. Capitalization \$2,000,000. Claims to have copper lands on Prince of Wales Island, Alaska. Had an option on a mine in Idaho, and paid dividends while peddling stock. Lost the Idaho mine, and management being bad, and property problematical, stock may be considered valueless.

HARTWIG MINING CO.**IDAHO.**

Office: care of Dr. R. A. Nash, president, Tipton, Iowa. Mine office: Pollock, Idaho Co., Idaho. Organized 1905, under laws of Iowa, with capitalization \$72,500. Property shows a contact copper vein, 3' wide at surface, and 12' wide in a 100' tunnel. Formation is granite and limestone, vein carrying \$1.50 to \$72 per ton values, mainly in copper, with an average of about \$1.50 silver and \$4 gold per ton. The 875' lower tunnel has cut the ore zone, but shows very little ore.

HARVARD MINE.**ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. W. P. Hamlin, et al., owners. Ores carry gold, silver and copper. Has gasoline power. Presumably idle.

HASSAYAMPA GOLD & COPPER MINING CO.**ARIZONA.**

Office: 202 North Ninth St., St. Louis, Mo. From title, lands, if any, presumably are located in Yavapai county, Arizona.

HASKINS MINING CO.**ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Lands are sundry claims in the Tucson Mountains.

HATASA MINE.**JAPAN.**

Mine office: Hatasa-mura, Gujo-gori, Mino, Japan. Is an old property, opened previous to A. D. 1600, and once was highly productive. Has 4 principal veins, 3" to 2' in width, carrying argentiferous copper and lead ores, associated with sphalerite, iron pyrites, etc. Production, 1900, was 165,416 momme of silver and 38,651 lbs. fine copper.

HATHAWAY MINE.**MEXICO.**

Mine office: Santo Domingo, Chihuahua, Mex. Lands, 18 miles south of Santo Domingo, show two small but persistent veins, carrying rich sulphide ores. Has an old smelter, not in blast, and ships concentrates to Aguascalientes, for reduction, when working. Presumably idle.

HATTIE BELL COPPER, GOLD & NICKEL MINING CO.**ONTARIO.**

Dead. Lands sold to Consolidated Copper Co. of Parry Sound.

HATTIE GOLD AND COPPER MINING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Doniphan, Idaho.

HAWKEYE COPPER MINING CO.**WYOMING.**

Office: 519 Equitable Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Joseph A. Michel, president and treasurer; Geo. C. Waterman, secretary. Organized 1900, under laws of Wyoming, with capitalization \$500,000, shares \$1 par. Lands, 2 claims, area 40 acres, having a 35' shaft. Presumably idle.

HAWKEYE MINE.**OREGON.**

Office and mine: care of Byron Sherbindy, owner, Comer, Grant Co., Ore. Mine carries auriferous and argentiferous copper ores, and property is said to have a small smelter. Presumably idle.

HAXWORTH COPPER CO.**ARIZONA.**

Mine office: Agua Caliente, Maricopa Co., Ariz. Lands, 25 claims. Idle.

HAYES MINE.**BRITISH COLUMBIA.**

Owned by Nahmint Mining Co.

HAYFORD MINES, LTD.**ENGLAND.**

Voluntarily liquidated, February, 1905.

HAYMAN MINING & TUNNEL CO.**COLORADO.**

Mine office: Tarryall, Park Co., Colo. Lands, sundry claims, said to show lead and copper ores. Presumably idle.

HEADLIGHT COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former office and mine, Encampment, Carbon Co., Wyo.

HEADLIGHT GOLD MINING & MILLING CO.**COLORADO.**

Mine office: Spencer, Gunnison Co., Colo. L. C. Ehbeding, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

HEALDSBURG LODGE.**CALIFORNIA.**

Office and mine: care of J. G. Caldwell, manager, Healdsburg, Sonoma Co., Cal. Lands, 1 claim, 10 miles north of Healdsburg. Opened, circa 1885, by tunnel. Idle at last accounts.

HEART OF ARIZONA GOLD & COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, Detroit, Mich. Mine office: Prescott, Yavapai Co., Ariz. Organized 1902, under laws of Arizona, with capitalization \$1,000,000. Idle at last accounts.

HEATH MINING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Heath, Idaho.

HECLA & ARIZONA DEVELOPMENT CO.**ARIZONA.**

Title changed, 1903, to Red Jacket & Bisbee Development Co.

HECLA & ARIZONA GOLD & COPPER MINING CO.**ARIZONA.**

Office: care of J. M. Carroll, Weatherford, Texas. Organized 1902, to take over claims near Bisbee, Cochise county, Arizona. Idle.

HECLA CONSOLIDATED MINING CO.**MONTANA.**

Office: Indianapolis, Ind. Mine office: Dillon, Beaverhead Co., Mont. Henry Knippenberg, president and general manager. Property includes the Atlantis, Cleve and other mines, carrying auriferous and argentiferous copper and lead ores. Was a large producer, for many years, making circa 100,000 pounds copper yearly, as a by-product, and paid dividends of \$2,250,000, without assessments, on an original investment of \$40,000, but the shareholders refused to liquidate a \$30,000 indebtedness, and property was sold by sheriff and bid in by sundry shareholders. Attempts at reorganization have been unsuccessful, and property is for sale.

HECLA COPPER & GOLD MINING, MILLING**WYOMING.****& SMELTING CO.**

Reorganized, October, 1904, as Hecla Mining Co.

HECLA COPPER MINING CO.**WYOMING.**

Letters returned unclaimed from former office, Manistee, Mich., and former mine office, Encampment, Carbon Co., Wyo. Lands were 4 claims, area circa 30 acres, adjoining the Kurtz-Chatterton.

HECLA MINES.**WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Lands, sundry claims, in vicinity of Seattle. Idle for several years.

HECLA MINING CO.**WYOMING.**

Office: 1624 Curtis St., Denver, Colo. Mine office: Hecla, Laramie Co., Wyo. Henry Schwartz, president and general manager; Geo. C. Norris, vice-president; Louis Williams, secretary; Geo. L. Bettcher, treasurer. Organized October, 1904, under laws of Wyoming, as a reconstruction of the Hecla Copper & Gold Mining, Milling & Smelting Co., with capitalization \$1,000,000, shares \$1 par. Lands, 16 claims, 2 patented, and a 45-acre millsite, area 365 acres, including the townsite of Hecla, 5 miles from a railroad, in the Silver Crown district, showing 16 fissure veins, averaging 8' width, in schist and granite, of which 3 are being developed, these averaging 7' width and giving average assays of 5% copper, 3 oz. silver and \$10 gold per ton, in addition to which they carry estimated average values of \$10 to \$12 per ton in nickel, platinum and uranium. Ores are oxides, carbonates and sulphides, opened by a 40' tunnel and 14 shafts of 10' to 140' depth. Has steam power, 15-stamp mill and 50-ton concentrator and leaching plant; in a building 80x100'. The Ohly process was installed, with a view to saving the rare metals in the ore, but was not a success. It is strange, how new mining companies, with no cash to spare, will experiment with new and untried reduction processes, to their own detriment or destruction. Ore is mainly low grade, part of which will concentrate, while part will not.

The management was well spoken of, in the last annual edition of the Copper Handbook, but since that time the company has begun peddling "guaranteed" stock, for which reason the commendatory words regarding the management are hereby withdrawn. Any mining company that sells "guaranteed" stock is guilty of what perilously approaches a fraud upon its shareholders, and its stock should be let severely alone.

GEWERKSCHAFT HEDWIGSLÜCK.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Rheinbach, Kreis Bruhl-Unkel, Rheinprovinz, Germany. Lands, 437.7 hectares, carrying copper, lead and zinc ores, developed by 2 shafts.

HELEN MINING CO.**NEW MEXICO.**

Mine office: Graham, Socorro Co. N. M. Thos. Graham, president. Property is the Confidence group, ores of which carry gold, silver and copper. Has a 30-stamp mill, and is equipped with steam, water and electric power.

HELGA GOLD COPPER CO.**BRITISH COLUMBIA.**

Office: Sullivan Bldg., Seattle, Wash. Mine office: Clayoquot, Vancouver Island, B. C. Property is the Good Hope group, on Trout river, developed by a tunnel, said to give a fair showing of ore.

HELSINGBORG'S KOPPARVERK,**SWEDEN.**

Is the refining plant of the Sulitelma Aktiebolag, at Helsingborg, Malmöhus Län, Sweden.

HELVETIA COPPER CO.**ARIZONA.**

Office: 27 State St., Boston, Mass. Mine office: Helvetia, Pima Co., Ariz. Employes circa 200 men. Wm. A. Paine, president; Frederic Stanwood, vice-president; Fred. B. Close, general manager; C. F. Shelby, con-

sulting engineer. Organized March 3, 1899, under laws of New Jersey, and reincorporated, 1905, under laws of Arizona, with capitalization \$5,000,000, shares \$25 par, \$10 paid in. Old Colony Trust Co., Boston, transfer agent. Annual meeting, third Wednesday in February. Lands, 55 patented claims, area 1,100 acres, also 900 acres miscellaneous lands, in the Santa Rita Mountains, 35 miles southeast of Tucson. Formation greatly resembles that at Bisbee, the carboniferous limestone strata being of the same geological horizon, with similar porphyritic intrusions, but showing much stronger outcrops and gossans.

The mine made an exceptionally fine showing from a depth of 35', but ores turned to sulphides on the third level, the base ores averaging under 5% copper. Property has about 25 old shafts, and the two working shafts are known as the Isle Royale, 600', and the Old Dick, 800'. The mine has 1,940' of shafts, 15,688' of tunnels and drifts and 5,200' of open-cuts. The Old Dick mine has an open-cut showing a large ore body carrying 4% to 6% copper, with small gold and silver values. The Heavy Weight mine shows low grade concentrating ores. The lower levels of the Isle Royale show sulphide ores, much needed for fluxing, which formerly were lacking. Sufficient water for mine and smelter use is furnished by the Isle Royale shaft. Mining plant includes gasoline hoists, also gasoline and steam air-compressors.

The smelter, $2\frac{3}{4}$ miles from the mines, is connected therewith by a private railway line. The first smelter, built 1899, was burned, 1900, and the present smelter, of 150 tons daily capacity, was blown in, 1901. Largest production was circa 1,000,000 lbs. fine copper, in 1901, after which the mine and smelter were closed down, owing to the exhaustion of the richest oxide and carbonate ores, opened in the upper levels, and the lack of sulphides for fluxing the lower grade oxidized ores. Property was taken under option, 1904, by the Michigan & Arizona Development Co., on terms explained in Vol. V, and was deepened and put on a productive basis by that company, which took pay for its work in stock of the Helvetia Copper Co. Returns from 26,892 tons of ore smelted, 1900-1901, averaged \$14.47 per ton. The smelter was again blown in, early in 1906, and in May was making circa 6 tons fine copper daily. The matter of erecting a 500-ton concentrator has been considered, as also has the plan of building a new 300-ton smelter and remodeling the present smelter for a matting furnace. Mine is 16 miles from the Southern Pacific railway, at Vail Station, and a private railway to connect therewith may be constructed. Apparently the Helvetia has the making of a large and profitable mine.

HENRIETTA MINE.**ARIZONA.**

Owned by Braganza Gold Mining Co.

HENSON CREEK LEAD MINES CO.**COLORADO.**

Office: 15 Court St., Boston, Mass. Mine office: Lake City, Hinsdale Co., Colo. C. E. Whiting, president; P. T. Newitt, superintendent. Property includes the Bonanza, Magnolia, and other mines, carrying ores of gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator.

HERCULES CONSOLIDATED MINING CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Thos. H. Kane, superintendent, at last accounts. Mines cupriferous gold and silver ores, and has a 40-stamp mill.

HERCULES GOLD & COPPER CO.**NORTH CAROLINA.**

Office: 81 Fulton St., New York. Mine office: Cid, Davidson Co., N. C. Wm. A. Anderson, president; H. L. Prentice, vice-president; Robert E. Nuese, secretary; Saml. G. W. Brown, treasurer and general manager. Organized May, 1901, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, circa 1,000 acres owned in fee, and 1,300 acres held under contract, in Davidson county, including the Emmons mine, opened before the American Civil War. Lands show 3 fissure veins, ranging 18" to 15' wide, said to give average assays of 7% copper, 2 oz. to 17 oz. silver and \$1.50 to \$15 gold per ton, from melaconite, bornite and chalcoppyrite, mainly the latter. Is opened by shafts of 90', 140', 310' and 510', and by tunnels of 100', 100', 1,500' and 2,500', estimated to show about 65,000 tons of ore blocked out for stoping. Has a 600-h. p. steam and electric plant, including 4 hoists, good for depth of 1,000' each, a 20-drill Clayton duplex air-compressor and 16 power drills. Buildings include a 30x40' smithy, 16x24' compressor house, shafthouses of 40x64' and 60x80', and 12 dwellings. Has a 30x60' concentrator and a smelter with a 150-ton Allis-Chalmers water-jacket furnace. Nearest railway, 14 miles. Has on the dump several thousand tons of ore, extracted in development. Property considered promising, but apparently is idle.

HERCULES MINING CO.**WYOMING.**

Office: 523 Bee Bldg., Omaha, Neb. C. M. Jacques, president and general manager; J. E. Thatcher, secretary and treasurer. Capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, area 80 acres, showing fissure veins of 9' average width, giving assay values of 5% to 49% copper, from carbonate and sulphide ores. Has a 90' tunnel and a 280' shaft, with steam and gasoline power. Idle since 1903.

MINAS HERCULES y OTRAS.**CHILE.**

Mine office: Taltal, Antofagasta, Chile. Henri Hintze, owner and manager. Mines include the Hercules, Silesia and Inesperada, which are producers of gold and copper ore. Have steam power and 4 Chilean mills, employing about 100 men, at last accounts.

HERKULES FRISCHGLÜCK-STOLLN UND KIESELS**GERMANY.****HOFFNUNG ERBSTOLLN.**

Office: care of E. R. Poller, Johanngeorgstadt, Saxony, Germany. Ores are sphalerite and chalcoppyrite.

HERMINA MINING CO., LTD.**ONTARIO.**

Office: Fifth St, Calumet, Mich. Mine office: Massey Station, Algoma, Ont. Employs 45 men. Joseph Hermann, president; Wm. H. Greene, vice-president; H. Appleton, secretary; Wm. B. Anderson, treasurer; preceding officers: Paul P. Roehm, Edward L. Ulseth, H. E. Lean and Peter Primeau, directors; Wm. Daniell, superintendent. Organized 1903, under

laws of Ontario, with capitalization \$2,500,000, shares \$12.50 par, \$8 per share paid in; issued, \$1,078,750. Merchants & Miners Bank, Calumet, Mich., registrar.

Lands, 1,240 acres, held on bond and lease, also 300 acres timber lands, in Salter township, Sudbury mining district, showing 3 contact veins, between schist and quartzite, these standing nearly vertically, with dip of about 85° and having an average width of 5', 7' and 24', and being traceable circa 2.5 miles. Veins No. 1 and No. 2, which are undergoing development, are about 1.5 miles apart. Ore is exclusively chalcopyrite, and a careful sampling of No. 3 shaft, by Dr. G. Fernekes, gave 4.3% copper and \$2.80 gold per ton. Has 3 shafts, No. 1 having a vertical depth of 300', No. 2 being 210', and No. 3 also being 210' in depth. Mine also has a 220' tunnel. Development has been continuous since begun, 1903.

Equipment includes a 150-h. p. steam plant, with Allis-Chalmers hoists of 50 h. p. and 75 h. p., good for 2,000' each, a 5-drill Rand air-compressor, 7 power drills, a 22x46' machine shop, 18x36' carpenter shop, 18x32' smithy, engine-house, boiler-house, etc., with a total of 14 frame buildings.

No. 1 shaft, 300' deep, is the principal opening. A sample shipment of 3 cars of ore gave returns of better than 10% copper, with small gold values. No. 3 shaft, which is on No. 3 vein, shows an ore body of 24' in width, but lower in grade than the ore in No. 1.

Property is served by the Canadian Pacific railway, 2 miles distant. Fuel is wood, costing \$1.25 per cord. Company plans sinking No. 3 shaft to the 400' level, and beginning production, during 1906. The matter of building a 300-ton smelter, on the north shore of Lake Huron, is under consideration. Management is good and property is considered promising.

HERMIT GOLD & COPPER MINING & SMELTING CO. ARIZONA.

Letter returned unclaimed from former office, Salt Lake City, Utah. J. W. Lee, president; Edwin W. Lee, treasurer; F. J. Barber, secretary. Organized 1904, under laws of Utah, with capitalization \$100,000, shares 10 cents par. Lands are the Hermit group, in Coconino county, Arizona. Idle.

HERMIT LAKE COPPER CO. COLORADO.

Office: 31 Milk St., Boston, Mass. Mine office: Silver Cliff, Custer Co., Colo. John H. Norton, president; Oliver J. Kimball, secretary; W. S. Elmendorf, superintendent. Organized 1899, under laws of Maine, with capitalization \$2,000,000, shares \$20 par. Ores carry gold and copper. Has water power and a 20-stamp mill.

HERMOSA COPPER CO. NEW MEXICO.

Office: 42 Broadway, New York. Mine office: Hanover, Grant Co., N. M. Employs circa 300 men. Anson W. Burchard, president; M. F. Westover, secretary; D. M. Riordan, treasurer and general manager; Henry N. Darling, assistant treasurer; L. B. Judson, assistant secretary. Organized July 20, 1905, under laws of New Jersey, with capitalization \$100,000, shares \$100 par. Corporation Trust Company, New York, registrar. Annual meeting, first Monday in June.

Lands, 114 claims, area circa 2,200 acres, held partly in fee and partly under option, all in the Central or Hanover district. Lands include the Ivanhoe, Copper Queen, Treasure Vault, Wild Cat, Ninety, Humboldt, Tourmaline, and other mines and attempts at mines. Country rocks are porphyry, granite, quartzite and limestone, showing various contact veins between granite and limestone, with porphyry intrusions, ores occurring as lenticular bodies, in veins, with a generally northeasterly and southwesterly strike, and an average dip of circa 45°. Four different ore bodies are being developed, these ranging 15' to 20' in width, with a known depth of 410' and known length of 2,000. Development is by shafts, as follows: Ivanhoe, 350'; Ninety, 410'; Treasure Vault, 325'; Wild Cat, 410'; Humboldt, 300'; Copper Queen, 200'; Tourmaline, 300'; Mabel, 200'. All shafts show ore, and the various mines have about 14,000' of underground workings, estimated to show 100,000 tons of ore, with 25,000 tons blocked out for stoping. The property shows large bodies of low-grade concentrating ore, carrying average values of 3% copper, 3 oz. silver and slightly under \$1 gold per ton, with small quantities of lead near the surface, and occasional traces of zinc, but not in sufficient quantities to materially hamper reduction.

The mines were discovered circa 1800, and opened 1880, but were worked intermittently, owing to various Indian troubles and lack of funds, until taken over, 1904, by the present owner, which practically is the General Electric Company, one of the strongest corporations of the United States.

Property has a steam plant of 700 h. p., with 7 hoists, good for depth of 500' to 1,000', and has bought 3 powerful new hoists for the Ivanhoe, Humboldt and Copper Queen shafts. Equipment includes 4 Sullivan air-compressors, of 26 drills aggregate capacity, with 26 power drills, and buildings include a 20x40' machine and blacksmith shop, 40x100' carpenter shop and framing-mill, shafthouses at each shaft, warehouse, bunkhouses, sawmill, etc., with a total of 23 buildings, all of wood.

The concentrator, 40x90', has a No. 14 Blake crusher, two sets of rolls, one Hartz jig, 5 Overstrom tables, 2 Wilfley tables, 7 screw sizers, one hydraulic sizer and a Huntington mill, rated capacity of the plant being 100 tons daily. Property is served by the Santa Fé railway. Fuel is bituminous coal, costing \$5.25 per ton, with a little wood, costing \$3.75 per cord. Cost of mining is placed at \$2.50 per ton, and concentrating at 50 cents per ton. The property is being developed systematically, on a large scale, and is considered decidedly promising, while the management is excellent.

MINA LAS HERRERIAS.

SPAIN.

Operated by Bede Metal & Chemical Co., Ltd.

HESPERUS GOLD & COPPER MINES CO.

BRITISH COLUMBIA.

Office: care of Samuel P. Brannan, secretary, 709-145 La Salle St., Chicago, Ills. Mine office: Grand Forks, Yale district, B. C. Chas. J. Magee, president; T. H. Rae, managing director. Organized 1903, with capitalization \$1,000,000, shares \$1 par. Property includes the Betts, Hesperus, Lancaster

and Chicago claims, on Hardy Mountain, circa 4 miles from Grand Forks, developed by several hundred feet of crosscuts and shafts, showing promising bodies of self-fluxing sulphide ore. No. 2 tunnel is planned to be driven 600'.
HETTA MOUNTAIN GROUP. **ALASKA.**

Lands, 8 claims, near Copper Harbor, Prince of Wales Island, Alaska, in north latitude 59°. It is asserted that property has a vein 2' to 20' wide and 3,000' long, averaging 10% copper, 3 oz. silver and \$2 gold per ton, which is claiming too much.

HETTIE GREEN GROUP.

BRITISH COLUMBIA.

Office and mine: care of James Thompson, owner, Alberni, Vancouver Island, B. C. Lands, on Tranquil Creek, Bear River district, Clayoquot division, give a fair showing of chalcopryite, with occasional bornite. Began production on a small scale, 1905, making several small shipments of good ore to the Tyee smelter.

HIBBE GOLD & COPPER MINING CO.

CALIFORNIA.

Office: Sheridan, Cal. N. H. Kaichner, president; Geo. Grutman, secretary and treasurer. Organized 1903, with capitalization \$75,000, to operate in Hibbe county, California. Presumably idle.

HIBIRA MINE.

JAPAN.

Mine office: Kitakata-mura, Higashi-Usuki-gori, Hyuga, Japan. Is an ancient mine, carrying chalcopryite associated with iron pyrites, averaging 5% to 6% copper, in lenses lying in clay-slate and sandstone. Production, 1900, was 1,769,498 lbs. fine copper.

J. F. HICKS & CO.

TENNESSEE.

Mine office: Bristol, Sullivan Co., Tenn. Lands, sundry copper claims, slightly developed. Idle for some years.

HIDALGO MINING CO.

MEXICO.

Office: care of W. M. Adamson, manager, Douglas, Ariz. Mine office: Nacozari, Sonora, Mex. Employs 20 men. Organized under laws of Arizona, with capitalization \$3,500,000, shares \$1 par. Lands, 80 pertenencias, area 198 acres, in 3 groups, lying circa 6 miles west of the Moctezuma Copper Co., and 4 miles from the Nacozari railroad. Property shows a vein of 200' estimated width, carrying a 12' paystreak giving assays of 15% to 30% copper, opened by a 135' tunnel and 300' main shaft, with about 2,000' of workings. Ores assay also \$2.50 to \$8 gold per ton, with a little lead. Property has a spring, water from which has given assays of 6.5 grains copper per gallon. Management is good and property is considered promising.

HIDDEN TREASURE GROUP.

CALIFORNIA.

Office and mine: care of Alger Bros., owners, Callahan, Siskiyou Co., Cal. Lands, 3 claims, on Boulder Creek, 4 miles southwest of Callahan. Has a 100' tunnel, showing an 8' vein of disseminated chalcopryite, with quartz gangue. Presumably idle.

HIDDEN TREASURE GROUP.

MONTANA.

Office and mine: care of W. J. Stephens, owner, Higgins Blk., Missoula, Missoula Co., Mont. C. A. Russell, superintendent. Employs 4 to 10 men.

Lands, 6 patented claims, in the Wallace district, carrying 3 contact veins, between slate and porphyry, main vein showing 40' of concentrating ore and a 30' paystreak of sulphide shipping ore, latter giving smelter returns of 13% copper, 28 oz. silver and \$5.50 gold per ton. Management estimates average values at 6% copper, 12 oz. silver and \$3.75 gold per ton. Development is by shafts of 58' and 149', and by tunnels of 558' and 1,300', with about 3,000' of underground openings, with upwards of 1,000 tons of ore blocked out for stoping. During 1905 shipped 260 tons, averaging about \$30 per ton in value, to the East Helena and Tacoma smelters.

HIDDEN TREASURE MINING & MILLING CO.**WASHINGTON.**

Office: 27 Pacific Blk., Seattle, Wash. Mine office: Methow, Okanogan Co., Wash. Joseph West, treasurer and general manager. Organized 1896. Has a fissure vein of 2' to 4' average width, with occasional chutes of 8' to 10' width, traversing gneiss and carrying auriferous and argentiferous galena, sphalerite and chalcopryite, with quartz and calcite gangue. Smelter shipment of 90 tons gave returns of \$67 per ton. Presumably idle.

HIDDEN TREASURE MINING & TUNNELSITE CO.**WYOMING.**

Office: Lincoln, Neb. Letter returned unclaimed from former mine office, Battle, Carbon Co., Wyo. H. M. Rice, manager. Had auriferous and argentiferous copper ores, opened by tunnel.

HIGASHIYAMA MINE.**JAPAN.**

Mine office: Higashiyama-mura, Oe-gori, Awa, Japan. Ore is chalcopryite, associated with iron pyrites, occurring in lenses lying in quartz schist, and averaging 2% to 2.5% copper. Production, 1898, was 104,424 lbs. fine copper.

HIGGINS DEVELOPMENT CO.**ARIZONA.**

Dead. Fully described in Vols. IV and V.

HIGGINS GROUP.**ARIZONA.**

Office: care of Thos. Higgins, Los Angeles, Cal. Mine office: Bisbee, Cochise Co., Ariz. Property was under bond formerly to Higgins Development Co., and was fully described, under that title, in Volumes IV and V.

HIGH HILL MINE.**VIRGINIA.**

Owned by Virginia Copper Co., Ltd.

HIGHLAND BOY CONSOLIDATED MINING CO.**UTAH.**

Office: care of Clarence K. McCornick, secretary and treasurer, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. J. W. Houston, president. Lands, 54 acres, surrounded by the Utah Consolidated, Yampa, Boston Consolidated and other mines. Development is by a 2,600' tunnel, with about 4,000' of underground openings. Property regarded as decidedly promising.

HIGHLAND BOY GOLD & COPPER MINING CO.**UTAH.**

Controlled, through stock ownership, by Utah Consolidated Mining Co.

HIGH LONESOME GOLD MINING & MILLING CO.**COLORADO.**

Mine office: Coulter, Grant Co., Colo., Dr. W. E. Rammel, secretary and treasurer; E. S. Reardon, vice-president and superintendent. Organized 1902, with capitalization \$500,000. Is claimed to have a 38' ore body, ex-

posed by open-cut, averaging 18% to 21% copper and one-half oz. gold per ton, which, of course, is somebody's gross exaggeration.

HIGH ORE GOLD & COPPER MINING CO.**MONTANA.**

Letter returned unclaimed from former mine office, Basin, Mont.

HIGH ORE MINE.**MONTANA.**

Owned by Anaconda Copper Mining Co.

HIGH TOP COPPER MINING CO.**VIRGINIA.**

Office: 1552-150 Nassau St., New York. Mine office: Elkton, Rockingham Co., Va. Morris D. Brown, president; Prentice W. Brown, secretary and treasurer; S. D. Brown, general manager. Lands, circa, 1,000 acres, in Greene county, Virginia, 7 miles from the Norfolk & Western railroad, said to show 3 wide fissure veins, carrying carbonate and sulphide ores, latter estimated to contain average values of 6% copper, 10 oz. silver and \$15 gold per ton, which is entirely too high. Apparently development is confined to a 140' shaft and some open-cuts. Has steam power. Presumably idle.

MINA LA HIGUERA.**CHILE.**

A small copper producer in the vicinity of Coquimbo, Chile. Possibly same as Compañía Minera San Juan.

HILETA GOLD & SILVER MINING CO.**MEXICO.**

Mine office: Velardeña, Durango, Mexico. Employs 100 men. Carter Barker, general manager. Lands, 32 pertenencias, area 79 acres, also 63 acres miscellaneous lands, adjoining the Velardeña mines. Country rocks are limestone and porphyry, showing 5 veins, of which one, of 12" to 3' width, opened by a 1,600' tunnel, with about 4,000' of workings, carries ore averaging about 2% copper, 7% lead, 5% zinc, 60 oz. silver and \$4.50 gold per ton. Equipment includes a steam plant, with two hoists, good for 1,000' each, and a 4-drill air-compressor.

F. C. HILLS & CO.**SPAIN.**

Operators of Compañía del Ferrocarril y Minas del Buitron.

HILLSIDE COPPER MINING CO.**NEVADA.**

Office: 201 Exchange Bldg., Denver, Colo. Mine office: Pioche, Lincoln Co., Nev. Wm. Gelder, president; M. E. Buffington, secretary; J. E. Gelder, treasurer. Organized 1901, under laws of Nevada, with capitalization \$2,000,000, shares \$1 par. Lands, sundry mining claims, in the Bristol district, 50 miles from a railroad, including mines that formerly paid considerable dividends from silver-lead ores, which at depth changed to silver-copper ores. A small test shipment gave smelter returns of 12% copper and 12 oz. silver per ton. Is closely connected, in ownership and management, with the Bristol Copper Mining Co. Property considered promising, if given rail connections, but at last accounts was idle, and owed circa \$30,000 to its promoters.

HIMALAYA MINING CORPORATION, LTD.**INDIA.**

Dissolved, January, 1905.

HIMMELFAHRT FUNDGRUBE.**GERMANY.**

Office: care of Kgl. Sachs. Staatsfiskus, Dresden, Germany. Mine office: Freiberg, Saxony, Germany. Employs circa 1,100 men. K. Ste-

phan, manager. Is owned and operated by the Saxon Crown. Ores carry silver, lead and copper, production of latter being very small.

HIRAKANE MINES.

JAPAN.

Mine office: Nibukawa, Rikuchu, Japan. T. Yokoyama, owner; S. Tsubouchi, superintendent. Ores carry silver and copper. Mines have steam and electric power, and a smelter, employing several hundred men.

HISAMUNE MINE.

JAPAN.

Mine office: Kawada-mura, Oe-gori, Awa, Japan. Is a comparatively new property. Ore, which is chalcopryrite, slightly argentiferous, and averaging 4% copper, occurs imbedded in clay-amphibolite, beds ranging 2' to 5' in thickness. Production, 1899, was 112,196 lbs. fine copper.

HISANICHI MINE.

JAPAN.

Mine office: Nakagawa-mura, Senhoku-gori, Ugo, Japan. Ore is chalcopryrite, associated with sphalerite and iron pyrites, all slightly argentiferous, in a vein in augite-andesite. Production, 1900, was 134,074 momme silver and 566,268 lbs. fine copper.

HODGES HILL MINE.

NORTH CAROLINA.

An old and idle property in Guilford county, North Carolina. Ore is chalcopryrite, with quartz gangue, in a vein of 6' to 12' width.

HOFMAN CLAIMS.

CALIFORNIA.

Four claims, area 80 acres, near Ukiah, Lake county, California, giving assays of 6% copper, \$5 gold and 2 oz. silver per ton, from carbonate and sulphide ores. Idle.

HOFRET EL NAHAS MINES.

SUDAN.

In Southwest Kordofan, Anglo-Egyptian Sudan. Are worked in a small way, to meet purely local demands, ore being smelted in a primitive manner, at the mines.

HOGASHO MINE.

JAPAN.

Mine office: Hatayama-mura, Aki-gori, Tosa, Japan. Ore is chalcopryrite, associated with iron pyrites, averaging about 7% copper, and occurs in lenses in country rocks of shale and sandstone, with intercalated red and green schalkstein. Production, 1900, was 138,032 lbs. fine copper.

GEWERKSCHAFT HOHENSTAUFEN.

GERMANY.

Mine office: Essen, Rheinprovinz, Germany. W. Brandenburg, president. Mine produces yearly circa 3,000 metric tons of zinc and copper ores, zinc values predominating.

HOKOISHI MINE.

JAPAN.

Mine office: Kamo-mura, Nii-gori, Iyo, Japan. Ore is chalcopryrite, associated with pyrite, averaging 3.5% to 4% in copper tenor, occurring in narrow veins of 12" average width, traversing chlorite-amphibolite. Production, 1900, was 52,373 lbs. fine copper.

HOLDEN EXTENSION GOLD & COPPER MINING CO.

WASHINGTON.

Mine office: Chelan, Chelan Co., Wash. W. J. Bowen, secretary and general manager. Capitalization, \$1,500,000. Lands, 2 claims. Idle.

HOLDEN GOLD & COPPER CO.

WASHINGTON.

Mine office: Chelan, Chelan Co., Wash. J. H. Holden, president. Lands,

3 claims, area 60 acres, on Railroad Creek, near Lake Chelan, opened by 3 tunnels, longest 500', showing a vein of 40' to 54' width, carrying low-grade auriferous copper ores. Property needs cash for extensive development, and a railroad for transportation. Given these essentials, it might be made a valuable mine.

HOLLAND GOLD & COPPER MINING CO.**BRITISH COLUMBIA.**

Mine office: Princeton, Similkameen district, B. C. James E. McCauley, president. Lands, sundry claims, on the western slope of Copper Mountain, near the Similkameen river. Company planned resuming work in spring of 1906.

HOLLAND MINE.**ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. G. W. Crowe, superintendent. Mine is opened by shaft and tunnel, showing auriferous and argentiferous chalcopyrite, sphalerite and galena. Has steam power and a small concentrator.

HOLLOWAY MINE.**VIRGINIA.**

Office: care of Alfred S. Wright, owner, 48 South Third St., Philadelphia, Pa. Mine office: Virgilina, Halifax Co., Va. Property is the old Holloway or Eustis mine, 6 miles north of Virgilina, first worked previous to the American Civil War. Ores are sulphide, mainly chalcopyrite, carrying small gold and silver values. Mine shipped considerable ore to smelters at Norfolk, Va., circa 1900-1903. Present owner plans continuing development.

HOLMES MINING & MILLING CO.**WISCONSIN.**

Office and mine: Mellen, Ashland Co., Wis. C. A. Poundstone, president; John Holmes, vice-president; A. W. Peterson, secretary and general manager. Organized 1902, under laws of Wisconsin, with capitalization \$150,000, shares 25c. par. Lands, 80 acres, in the Penokee district, showing three veins carrying native copper, also sulphide copper ore assaying 30 oz. silver and \$3.70 gold per ton, opened by a 140' shaft. Idle.

HOME COPPER CO.**ARIZONA.**

Office and mine: Morenci, Graham Co., Ariz. Dr. A. M. Tuthill, president; R. H. Waugh, secretary and treasurer; N. L. Jenkins, superintendent. Organized April, 1901. Lands, 35 claims, area circa 700 acres, in 2 groups, also a millsite on Eagle river. The Peacock group of 23 copper claims, about 1 mile southwest of Morenci, is opened by an 85' shaft and tunnels of 150' and 700', latter giving a 500' back. Ores are carbonates and oxides, with some chalcocite, also a wide ledge of low-grade ore that is too lean for present working. The Buzzard Shadow group of 12 claims, across Gold Gulch, about 1 mile north of the Peacock group, shows a wide quartz vein carrying gold ore worth up to \$50 per ton, slightly developed by tunnel and shaft. Is developing steadily.

HOME COPPER CO.**WASHINGTON.**

Mine office: Cle-Elum, Kittitas Co., Wash.

HOME COPPER MINING CO.**MICHIGAN.**

Lands, 240 acres, adjoining the Humboldt mine, in Keweenaw county, Michigan. Never a producer.

HOME COPPER MINING CO.**MONTANA.**

Disincorporated, 1903, with all debts paid.

HOME GOLD & COPPER CO.**NEW MEXICO.**

Dead, and lands passed to other hands.

HOME GOLD & COPPER CO., LTD.**ONTARIO.**

Letter returned unclaimed from former office, 90 Canada Life Bldg., Toronto, Ont. Fully described and identified, by genus and species, in Volumes IV and V. Stock was peddled by one Rufus L. Herrick, who opened his office with prayer.

HOME RUN COPPER MINING CO.**WYOMING.**

Office: 34 Giddings Bldg., Colorado Springs, Colo. Letter returned unclaimed from former mine office, Rudefeha, Carbon Co., Wyo. Capitalization \$1,500,000, shares \$1 par. Lands, 180 acres, 60 acres patented, near the Ferris-Haggarty mine of the Penn-Wyoming. Company claims to have no debts, but furnishes no returns, and its advertising is not regarded with favor.

HOMESTAKE MINE.**ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. Ores carry gold and copper. Has gasoline power. Presumably idle.

HOMESTAKE MINES, LTD.**BRITISH COLUMBIA.**

Mine office: Rossland, Yale district, B. C. Geo. H. Bayne, manager. Ores carry gold, silver and copper. Has steam power. Presumably idle.

HOMESTAKE MINING CO.**ARIZONA.**

Letters returned unclaimed from former office, Chicago, Ills., and former mine office, Jerome, Yavapai Co., Ariz. Apparently a petty swindle.

HONERINE MINE.**UTAH.**

Mine office: Stockton, Tooele Co., Utah. E. J. Raddatz, superintendent. Property is extensively developed and has a drainage and transport tunnel, on the 1,300' level, now 8,000' long, and to be 9,000' eventually. Mine is opened to depth of 1,000', and makes about 7,000 gallons of water per minute, hence the drainage tunnel will afford great relief. Property is primarily a silver-lead mine, but produces considerable copper. Ore produced is of two grades, the shipping ore averaging about 50% lead, 3% copper, 30 oz. silver and \$1.50 gold per ton, while the concentrating ore averages 15% lead, 1% copper, 12 oz. silver and 80 cents gold per ton. The milling ore is concentrated 3.5 into one.

HOOSIER COPPER MINING & MILLING CO.**WYOMING.**

Office: Shelbyville, Ind. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Capitalization \$1,500,000, shares \$1 par. Lands, 9 claims, area 180 acres, developed by a shallow shaft, said to give a fair showing of medium-grade ore. Idle.

HOP CANYON MINING & SMELTING CO.**NEW MEXICO.**

Office: 85-163 Randolph St., Chicago, Ills. Mine office: Magdalena, Socorro Co., N. M. Alpheus McCallum, president; Elias G. Raffety, secretary and treasurer. Capitalization \$1,000,000, shares \$1 par. Lands, 6 claims, area 120 acres, 3 miles from a railroad, in the Hop Cañon district, showing ores carrying copper, lead, zinc, silver and gold.

HORN GROUP.**CALIFORNIA.**

Office and mine: care of H. M. Horn, manager, Needles, San Bernardino Co., Cal. Lands, sundry claims at the base of Turtle Mountain.

HORN SILVER MINING CO.**UTAH.**

Office: 17 Battery Place, New York. Mine office: Frisco, Beaver Co., Utah. Allen C. Washington, president; Juan M. Ceballos, vice-president; Ambrose J. Harrison, secretary and treasurer; Philo T. Farnsworth, manager. Organized 1879, under laws of Utah, with capitalization \$10,000,000, shares \$25 par. Mine is extensively developed and is a considerable producer of zinc, lead, silver and gold, and secures a little copper as a by-product. The Old Bonanza mine shows good values at a depth of 800', carrying silver ores on the footwall, with a little copper on the hanging-wall. Equipment includes a 30-stamp mill. Production 1905, was 6,035,553 lbs. zinc, 3,464,007 lbs. lead, 6,539 lbs. copper, 104,231 oz. silver and 335 oz. gold. Copper production, 1902, was 717,353 lbs., showing a great decrease in three years. Net earnings 1905, were \$135,770, from which dividends of \$80,000 were paid. Property is an old producer, with a large dividend record, but is gradually declining in production and profits.

HORSE SHOE COPPER MINING CO.**ARIZONA.**

Dead. Former office, Park Row Bldg., New York. Lands, near Safford, Graham county, Arizona, have passed to another corporation. Ignatius L. Qualey, the president, Frank S. Weller, the secretary, Chas. Carbonelle, the treasurer, "Baker Tom" Putnam and "Larry" Summerfield, alias Fred Herbert, all were sentenced to the penitentiary, for swindles connected with sales of stock of this company, their frauds being of a flagrant nature.

HORSESHOE GOLD MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. N. H. Scheur, superintendent. Property is the Barnes mine, carrying gold, silver and copper ores. Has steam power.

HORSFAL MINING CO.**COLORADO.**

Mine office: Gold Hill, Boulder Co., Colo. D. Wiggers, superintendent. Ores carry gold, silver and copper. Has steam power.

HOUGHTON-ALASKA EXPLORATION CO.**ALASKA.**

Office: Houghton, Mich. Prof. Arthur E. Seaman, consulting engineer. Organized circa 1905, under laws of Michigan, with capitalization \$500,000. Lands, sundry claims in Alaska.

HOUGHTON DEVELOPMENT CO.**ARIZONA.**

Dead. Fully described in Vols. IV and V.

HOULIHAN GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Jerome Junction, Yavapai Co., Ariz. J. T. Whedon, president; Geo. Houlihan, vice-president; Geo. C. West, secretary and treasurer. Has a 100' shaft, said to cut a 35' vein. Idle.

HOWARD COPPER CO.**MONTANA.**

Letter returned unclaimed from former office, 618 Broadway, New York. Mine office: Phillipsburg, Granite Co., Mont. Lyman N. Loomis, of Butte, Montana, president and treasurer. Organized under laws of South

Dakota, with capitalization \$1,500,000, shares \$1 par. Title to lands, which were 60 acres, slightly developed, supposed to have been lost. President is said to be an honest man, but company was promoted by Ralph M. Jacoby.

HOWARD COPPER CO.

Office: 451 Equitable Bldg., Baltimore, Md.

HOWARD MINING CO.

VIRGINIA.

Mine office: Virgilina, Halifax Co., Va. C. N. Howard, general manager. Lands include the Chappel mine, 10 miles from Virgilina, adjoining the High Hill mine of the Virgilina Copper Co., on the northeast, also a gold property, about $4\frac{1}{2}$ miles north of Virgilina. Presumably idle.

HOWE SOUND MINING CO.

BRITISH COLUMBIA.

Office: care of Geo. H. Robinson, Vancouver, B. C. Organized under laws of Maine, with capitalization \$2,000,000, shares \$500 par. Said to have been formed to take over the Britannia mine, on Howe Sound, British Columbia.

HOWELL MINES.

AUSTRALIA.

Mine office: Howell, N. S. W., Australia. John Howell, manager. Property includes the Conrad mine, with a 250' main shaft, showing an ore body assaying 3% copper and 2 dwts. gold, with fair tin values.

HOWLE COPPER MINES.

ARIZONA.

Letter returned unclaimed from former mine office, Globe, Ariz.

HUACHUCA CONSOLIDATED DEVELOPMENT CO.

ARIZONA.

Office: Bisbee, Ariz. Mine office: Palmerlee, Cochise Co. Ariz. J. S. Palmerlee, president and general manager; Jas. G. Cowen, secretary; S. W. Clawson, treasurer; preceding officers, H. T. Hosking, L. G. Jackson, A. A. Brockway and J. T. Hood, directors. Capitalization \$1,250,000, shares \$5 par. Lands, 24 claims, area 480 acres, in the Huachuca Mountains, circa 25 miles west of Bisbee, opened by 2 tunnels and a 200' shaft, showing 8 parallel fissure veins of 3' to 28' width, carrying ore, with quartz gangue, assaying 3% copper, and up to \$28 gold per ton. Out of funds and idle, at last accounts.

FUNDICIÓN HUACRACOCHA.

PERÚ.

Office: care of Dr. Valentine, Lima, Perú. Works office: Morrococha, Peru. Works are 3 miles from Morrococha, on the shore of Lake Huacra-cocha, with railroad connections, and include a small concentrator, and smelter having a 30-ton water-jacket blast-furnace. Plant runs, irregularly, on ores of the district.

COMPAÑIA HUANCHACA DE BOLIVIA.

BOLIVIA.

Offices: 29, Rue de Londres, Paris, France. Mine office: Pulacayo, Potosí, Bolivia. E. Senechal de la Grange, president Bolivian board; Marquis J. de Gabriac, chairman French board; Don Luis M. Solá, general manager; Baron J. de Cotelin, consulting engineer; Segundo R. Nava, general secretary, Valparaiso, Chile; Jorge Lewis, agent, Antofagasta, Chile. Organized 1873, and reconstructed 1891, under laws of Bolivia, with capitalization increased, 1877 and 1891, to 40,000,000 francs, shares 125f. par. Largest dividend was 35f., 1891; dividend, 1903, was 2.5f.

Property is silver and copper mines, former more important. The silver mines, area 3,300 acres, at Pulacayo, are large producers. The company also owns smelters at Huanchaca and Playa Blanca, latter leased to the American Smelting & Refining Co., under option of purchase, expiring Oct. 30, 1907. Company has 600 miles of private telephone line, and operates the Antofagasta & Bolivia Railway, under lease.

HUBBARD-ELLIOTT COPPER MINES**ALASKA.****DEVELOPMENT CO. OF ALASKA.**

Office: 1115 Stock Exchange, Chicago, Ills. Western office: 411 New York Bld., Seattle, Wash. Employs 30 men. H. Curtis Elliott, president; Chas. G. Hubbard, vice-president and general manager; A. J. Elliott, secretary; John T. Evans, treasurer. Organized January, 1904, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Lands, 120 claims, area 2,400 acres, in the Copper River district, circa 150 miles from Valdez, Alaska, supposedly held under bond and lease. Country rock is greenstone, showing 26 fissure veins, said by management to average 20' to 65' width, 300' to 1,000' length and 1,100' depth. A considerable amount of diamond drilling has been done, and development is by the Elizabeth shaft of 192', and by the Elizabeth tunnel of 160', with circa 500' of underground openings, estimated by company to show 600,000 tons of ore, with 400,000 tons available for stoping, which necessarily is an over-estimate. The property shows high-grade ores, said by management to have been proven unaltered to a depth of 200'. Ores are oxides, carbonates and chalcocite, estimated by management to average 27% in copper tenor. Improvements consist of a smithy, carpenter shop and 4 cabins of logs.

HUDSON MINE.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. W. H. Ball, superintendent, at last accounts. Ores carry gold, silver and copper.

COMPAGNIE DES MINES DE CUIVRE DE HUELVA.**SPAIN.**

Office: Brussels, Belgium. Mine office: La Granada, Huelva, Spain. Don Pedro Melo y Novo, manager. Organized 1900, under laws of Belgium, with capitalization 1,000,000 francs. Property is the Numancia, Sagunto and Taoro mines, carrying cupriferous iron pyrites. Idle for several years.

HUELVA CENTRAL COPPER MINING CO., LTD.**SPAIN.**

Succeeded, 1903, by Huelva Copper & Sulphur Mines, Ltd.

HUELVA COPPER & SULPHUR MINES, LTD.**SPAIN.**

Offices: 75, Constantine Road, London, N. W., Eng., and 17, Blvd. Haussmann, Paris, France. Mine office: Almonáster, Huelva, Spain. P. Bouvard, chairman; C. Blanchard, managing director; G. D. Collas, secretary; A. Ladouce, assistant secretary. Organized Oct. 28, 1903, to take over property of the Huelva Central Copper Mining Co., Ltd., with capitalization £400,000, shares £1 par; issued, £340,457. Lands, 923 hectares, including the Monte Remero and Cueva de la Mora groups. Has leased 27 hectares to the Tharsis Sulphur & Copper Co., Ltd., on royalty. Lands, which lie between the Rio Tinto and Tharsis mines, are considered valuable.

HUERFANO GOLD & COPPER MINING CO.**COLORADO.**

Organized 1902, under laws of Kentucky, to develop prospects near Ojo, in the Sierra Blanca district of Huerfano county, Colorado. Idle.

HUESCA COPPER, IRON & LEAD MINES, LTD.**SPAIN.**

Offices: 49, Queen Victoria St., London, E. C., Eng. S. D. Cropper, secretary. Capitalization, £50,000. Apparently moribund.

HUINAC COPPER MINES, LTD.**PERÚ.**

Offices: Leadenhall House, London, E. C., Eng. E. Learoyd, secretary; A. L. Pearce, consulting engineer. Organized May 9, 1904, with capitalization £400,000, shares £1 par; issued, £339,878. Lands, 256 hectares, in the province of Ancash, Perú. Is said to have secured considerable mining development, and to be building a smelter.

COMPAÑIA MINERA DE HUIRIÁCHIC.**MEXICO.**

Mine office: Chalchihuites, Zacatecas, Mexico. John Stenner, president; C. A. Phelps, treasurer and general manager. Ores are argentiferous and auriferous chalcopyrite and galena, developed by shaft and tunnel.

HULBERT MINING CO.**MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Albert S. Bigelow, president; W. A. S. Chrimes, secretary; Wm. J. Ladd, treasurer; Norman W. Haire, general manager. Lands, 1,598 acres, in Town 57 North, Range 37 West; Town 56 North, Range 33 West, and Town 55 North, Range 34 West, Houghton county, Michigan. Lands are mainly undeveloped properties, and a considerable portion of the surface rights has been sold, mineral rights having been reserved by the company.

HUMBER CONSOLIDATED MINING & MANUFACTURING CO.**NEWFOUNDLAND.**

Office: 27 William St., New York. Letter returned unclaimed from former mine office, York Harbour, Nfld. W. L. Holt, president; J. R. Williams, vice-president; E. W. Faucette, secretary and treasurer; C. E. Willis, managing director; H. V. Smythe, superintendent; S. J. Goodney, mining captain; Corporation Trust Co., New York, registrar and transfer agent. Organized Sept. 23, 1902, under laws of New Jersey, with capitalization \$1,200,000, shares \$100 par, in 2,000 shares of 8% preferred and 10,000 shares of common stock. Company apparently has gone out of business, to all practical intents and purposes. Fully described in Vol. V.

HUMBOLDT COPPER CO.**NEVADA.**

Office: 609 Kohl Bldg., San Francisco, Cal. E. J. Miley, president; C. C. Darling, Jr., vice-president; M. P. Danly, secretary; preceding officers, E. B. Grace and Dr. Geo. E. Ebright, directors. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 8 claims, on Jackson Mountain, Humboldt county, Nevada, connected by good wagon road, with a railroad 60 miles distant. Property has circa 1,400' of workings, showing a vein of 12' width at surface, widening to 74' in the lower tunnel, carrying ores that have assayed 15% to 16% copper, 3 oz. to 5 oz. silver and \$1.65 gold per ton.

HUMBOLDT COPPER MINING CO.**MICHIGAN.**

Office: 64-50 State St., Boston, Mass. C. Howard Weston, president; John Brooks, secretary and treasurer; J. Wesley Clark, superintendent; preceding officers, W. C. Fisk and Ashley Watson, directors. Organized 1863, under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. Annual meeting, fourth Tuesday in March. Lands are about midway between the Arnold and Phoenix mines, in Keweenaw county, Michigan. Has one shaft, of 300', on the Arnold ashbed. Was opened 1853, and last exploratory work was done in 1901. About \$125,000 has been expended on the property, which never was a producer.

HUMBOLDT MINE.**NEW MEXICO.**

Office and mine: care of Schlosser & La France, owners, Fierro, Grant Co., N. M. Presumably idle.

HUMBUG MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. J. W. Roundy, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

HUNGARIAN COPPER CO.**MICHIGAN.**

Wound up, circa 1898. Lands now owned by Oneco Copper Mining Co. **HUNTERS CREEK MINING & MILLING CO.**

WASHINGTON.

Letter returned unclaimed from former office, 701 Phoenix Bldg., Minneapolis, Minn. Geo. W. Smith, president; M. L. Brain, secretary; Manson Rexford, treasurer. Lands, 20 claims, in Stevens county, Washington, said to show a vein of 18" to 40" width, assaying 17% to 20% copper. Company claims to have a 755' tunnel. Secretary Brain writes that a great injustice was done by the statement in Vol V that the company was alleged by shareholders to be a fraud. The annual report of the company is a curiosity, including the most remarkable financial statement ever seen by the Copper Handbook.

HUNT MINING & MILLING CO.**IDAHO.**

Office: 8 India St., Boston Mass. Mine office: Weiser, Washington Co., Idaho. Idle for several years.

HURON GOLD CO.**ARIZONA.**

Office and mine: Jerome, Yavapai Co., Ariz. Geo. W. Hull, president, treasurer and general manager; H. E. Wilcox, secretary. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area 80 acres, in the Big Bug district, showing a vein of 8' to 50' width, opened by a 125' shaft and a 680' tunnel, showing ore giving assays of 2.5% to 11% copper and \$5 to \$30 gold per ton. Idle.

HURON MINING CO.**WASHINGTON.**

Office: Everett, Wash. Mine office: Darrington, Snohomish Co., Wash. Ores carry copper and gold values. Has water power. Presumably idle.

HURONIAN COMPANY.**ONTARIO.**

A subsidiary corporation of the Canadian Copper Co.

HUSSLEMAN & SHAW GROUP.**CALIFORNIA.**

A group of 31 claims, in the Moonlight Creek district, Lights Cañon, Plumas county, California, slightly developed by tunnel.

HUSTON MINE.**ONTARIO.**

Office: care of John J. Case, Cerro de Pasco, Junin, Perú. Lands 1,400 acres, at Montgomery, 15 miles north of Thessalon, Algoma, Ontario. Vein, traced circa 3,000, is 60' between walls, with an 18' paystreak, assaying up to 8%. Vein stands up as a 40' bluff, and best can be developed by tunnels. Ore has a quartz gangue, and could be concentrated to 20% copper, or better. Property lacks rail transportation, and is undeveloped.

HYCO MINE.**VIRGINIA.**

An idle property, near Virgilina, Virginia. Fully described in Vol. II.

HYPOCKA MINING CO.**MONTANA.**

Out of business. Lands sold, 1906, to Butte Coalition Mining Co.

SOCIEDAD COLECTIVA IBARRA HERMANOS.**SPAIN.**

Offices: Sevilla, Spain. Mine office: Cortegana, Huelva, Spain. Don José Luis Buiza, manager. Property is the San Telmo group of 29 old mines, area 222 hectares, carrying cupriferous iron pyrites. Was undergoing development, at last accounts.

ICONOCLAST CONSOLIDATED MINES CO.**WASHINGTON.**

Office: 412 Berlin Bldg., Tacoma, Wash. Mine office: Keller, Ferry Co., Wash. J. R. Turner, president; C. E. Peterson, secretary. Organized 1902, under the laws of Washington, with capitalization \$2,500,000, shares \$1 par, as a consolidation of the Alliance Copper Mining Co. and the Iconoclast Gold & Copper Mining Co. Lands, 7 claims, area 115 acres, showing 3 contact veins, one claimed by company to be 150' wide and to assay 5% copper 2 oz. silver and \$5 gold per ton, from chalcopryrite. Development is by a 325' main shaft, and 3 tunnels, with aggregate length of 514'. Has gasoline power. Presumably idle.

ICONOCLAST GOLD & COPPER MINING CO.**WASHINGTON.**

Absorbed, 1902, by Iconoclast Consolidated Mines Co.

IDAHO CONSOLIDATED COPPER CO.**IDAHO.**

Mine office: Grangeville, Idaho Co., Idaho. Has a 700' tunnel, and is said to plan installation of electric power and a 100-ton reduction plant.

IDAHO CONSOLIDATED COPPER MINES CO.**IDAHO.**

Dead. Was a mere stock-jobbing scheme.

IDAHO COPPER MINING & SMELTING CO.**IDAHO.**

Office: 502 Andrus Bldg., Minneapolis, Minn. Operating office: care of Chas. G. Carruthers, general manager, Colville, Wash. Lands, 160 acres, on the Salmon river, in Idaho county, Idaho. Assays of surface ore are claimed to give 30% to 40% copper. Idle for several years.

IDAHO MILLING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Doniphan, Idaho.

IDAHO MINES CO.**IDAHO.**

Supposed to have been organized, 1904, by residents of Omaha, Nebraska, to develop copper claims in the Seven Devils district of Idaho.

IDAHO REDUCTION CO.**IDAHO.**

Office: Corcoran Bldg., Washington, D. C. Letter returned unclaimed from former mine office, Weiser, Washington Co., Idaho. Geo. A. Rahm,

president; C. F. Drake, vice-president; F. S. Bright, secretary; John Sennett, treasurer; preceding officers and S. Fairfield, directors. Organized 1903, with capitalization \$1,000,000, shares \$1 par. Said to plan a smelter, to use a new reduction process.

IDEAL MINING & DEVELOPMENT CO.**ARIZONA.**

Office: 38 Wall St., New York. Mine office: McCabe, Yavapai Co., Ariz. Employs 80 men. Cecil G. Fennell, general manager; M. J. Enright, superintendent Gladstone mine; Jas. O'Brien, superintendent Model mine.

The Gladstone mine, opened by a 900' shaft, to be deepened, has auriferous and argentiferous copper and lead ores. Equipment includes an electric pump, on the 800' level, handling 20,000 gallons of water daily, a 120-h. p. Hendrie & Bolthoff hoist, capable of raising 3-ton loads from 1,500', and a 4-drill Ingersoll-Sergeant air-compressor, all electrically operated by a Crocker-Wheeler motor. The Gladstone, which is considered a valuable property, ships high grade ore to the Humboldt smelter, and runs concentrating ore through the McCabe mill.

The Model mine, 6 claims, formerly known as the McCabe mine, was bought, circa 1906, for \$81,521. Development is by a 750' incline shaft, with about 12,000' of underground workings, showing several ore bodies carrying 8" to 10" of smelting ore, and 12" to 24" of milling ore, former carrying combined gold, silver and copper values of \$35 to \$85 per ton, and latter carrying about 2% copper, with small gold and silver values. Country rock is granite, with numerous intrusive porphyry dikes, the granite being much shattered. The water-level is found at depth of 40' only, below which the ore is an iron-sulphide, carrying small percentages of auriferous and argentiferous copper, lead and zinc.

The McCabe, or Model mill, has 10 stamps, a 50-ton Elspass mill, 1 Wilfley and 3 Standard tables.

IKONOMOFF CESSION.**BULGARIA.**

Office: care of M. Dimitri Ikonomoff, owner, Hotel Boulevard, Sofia, Bulgaria. Mine office: Kara-Bair, Bourgos, Bulgaria. Property, in the development stage, is held as a cession from the principality. Presumably idle.

IKUNO MINES.**JAPAN.**

Owned by Mitsu Bishi Gosschi Kwaisha.

ILION MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Property supposedly is under bond to W. F. Snyder.

ILLINOIS COPPER MINING CO.**WYOMING.**

Office: 862 Monadnock Blk., Chicago, Ills. Mine office: Encampment, Carbon Co., Wyo. Geo. H. Miller, president and general manager; N. V. S. Mallory, secretary and treasurer; Thos. R. Smith, superintendent. Organized 1899, under laws of Wyoming, with capitalization \$1,000,000 shares \$1 par. Lands, 9 claims, area 185 acres, in the Upper Platte district, showing 3 contact veins, principal said to be 18' wide, 50' deep and 4,500' long, carrying chalcocite, with quartz gangue, assaying 14% to 27% copper, 20 oz. silver and \$4 gold per ton. Has 3 shafts, deepest 70'. Idle.

ILLINOIS GOLD & COPPER MINING CO.**MEXICO.**

Letter returned unclaimed from former mine office, Panuco, Coahuila, Mexico. Property was Los Caballos mine, carrying gold-silver-copper ores.

IMA CONSOLIDATED MINING & MILLING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Patterson, Lelan Co., Idaho. Ores carry silver, gold and copper. Had steam power and a 100-ton concentrator.

IMPERIAL COPPER CO.**ARIZONA.**

Office: 11 Pine St., New York. Operating office: Tombstone, Ariz. Mine office: Silver Bell, Pima Co., Ariz. Employs 300 men. E. B. Gage, president; W. F. Staunton, vice-president and general manager; A. N. Gage, secretary and treasurer; preceding officers, Selwyn Eddy, F. M. Murphy, V. L. Mason and H. M. Robinson, directors; David Morgan, mine superintendent; C. C. Klingerman, railroad superintendent; S. F. Shaw, engineer; C. M. Dietz, auditor.

Organized May 15, 1903, under laws of Arizona, with capitalization \$5,000,000, shares \$10 par. Bonds, \$2,000,000 authorized, \$1,282,400 issued, at 6%. Ended 1905 with cash on hand, \$50,746.65, with \$84,155.06 due the company. First dividend, paid April 15, 1906, was \$100,000. Annual meeting, second Thursday in April.

Lands, 60 claims, mostly patented, area circa 1,000 acres, also a 640-acre millsite, at Redrock, with total holdings of circa 3,000 acres, in the Silver Bell district. Property includes the Old Boot mine, now known as the Mammoth, opened circa 1865, which was a limited producer of high-grade copper and silver-lead ores, at irregular intervals, before bought by present company. Property is in the Silver Bell Mountains, a small independent range, at an elevation of 2,900' above sea-level. These mountains have granitic bases, with limestone and quartzite cappings, latter much eroded and entirely gone at many points. There has been much faulting and shearing, ore bodies occurring as irregular lenses, with axes parallel to fault and fissure planes, and having a northwesterly strike. The granite-porphyry in the vicinity of the lenses, which occur mainly at the lime-porphyry contacts, is strongly mineralized with copper sulphides. Eruptive dikes of diorite are highly altered, and the ore bodies have strong gossan cappings. The geology of the Silver Bell Mountains is typical of some of the best Arizona copper fields, and is of a highly promising nature. The oxidized zone is comparatively shallow, not extending below 150' from surface, in the principal workings, which show a sharp change from the oxidized to the unaltered zone. The upper ores are mainly cuprite, malachite and azurite, which have furnished the bulk of past production, while the ores below the water-level are mainly chalcocopyrite, with occasional bornite. The mines also show some cupriferous silver-lead ore, much of which is an intimate mixture of galena, sphalerite and chalcocopyrite, decidedly difficult of satisfactory reduction. Ores mined average 9.08% copper, 1.2 oz. silver and 12 cents gold per ton.

The mine is opened by the Page crosscut tunnel, length 1,200', and by the Mammoth shaft, 500', and the Union shaft, 350', with a total of about 5

miles of underground openings, showing large quantities of ore. The Old Boot mine, now called the Mammoth, was opened to a vertical depth of about 400' by an incline shaft, which has been replaced by the 500' two-compartment Mammoth vertical shaft, the old shaft being used solely for ventilation and pump-columns. The Union shaft also has two compartments.

The mine has a 450-h. p. steam plant, with 5 hoists, of 12 h. p. 200 h. p. each, largest good for 1,000' depth. Equipment includes 2 two-stage Norwalk air-compressors, of 10-drill capacity each, and 15 power drills. Buildings include 20x30' and 30x80' machine shops, of wood, sheathed with corrugated iron, a 36x40' carpenter shop, 18x50' smithy, store, bunk-houses, boarding-houses, changing-houses, and 20 dwellings. The property includes an old 100-ton matting furnace, 1¼ miles from the mine, which probably will not be used at all, unless rebuilt, modernized and greatly enlarged, and a 10 ton experimental mill, 20x40', having 1 Gates crusher, 1 set of rolls, 2 Hartz jigs, 1 Wilfley table, 1 vanner, 1 sizer and 1 sampler. In order to secure rail connection with the Southern Pacific, the Imperial company built the standard-gauge Arizona Southern Railway, 21 miles in length, from Silver Bell to Redrock, equipped with 2 locomotives and 5 cars.

Production, 1904, was 3,030,632 lbs. fine copper, and for 1905 was 5,687,152 lbs., and should reach circa 7,000,000 lbs. in 1906. Plans are being made for a reduction plant, to be located at Redrock, and it is hoped to begin the work of actual construction during 1906. The plant will include both concentrator and smelter, of about 300 tons daily capacity each, giving a total capacity of circa 500 tons of raw ore daily, and will be erected and equipped as the first unit of a much larger plant, to which additions may be made from time to time, as circumstances render advisable. Other work planned for 1906 includes deepening the Mammoth shaft to 1,000', and installing a 40-drill Nordberg air-compressor.

The Imperial Copper Co. has the same management as the Tombstone Consolidated Co., which is composed of experienced, capable and successful mining men and capitalists. The property is well handled, and gives promise of making a large and profitable mine.

IMPERIAL COPPER CO.

ONTARIO.

Letter returned unclaimed from former office, Duluth, Minn. Organized November, 1899, to exploit bornite ore deposits in the Parry Sound district of Ontario.

IMPERIAL COPPER & GOLD MINING CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Was promoted in Milwaukee. Lands, on upper Cow Creek, are said to show a 30' schist dike, carrying chalcopryite in small quantities. Idle.

IMPERIAL COPPER MINING CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Pollasky, Fresno Co., Cal. Property was the Painter mine, showing a vein of 4' to 7' width, traversing diabase and amphibolite schist, and carrying oxidized ores averaging 15% copper, with gangue of talcose schist. Has 3 shafts, deepest 110'. Idle for some years.

IMPERIAL COPPER MINING CO.**UTAH.**

Apparently merged in, or is controlled by, Nevada-Utah Mines & Smelters Corporation.

IMPERIAL GOLD & COPPER MINING CO.**UTAH.**

Succeeded, 1903, by Imperial Copper Mining Co.

IMPERIAL MINING CO.**WASHINGTON.**

Office: care of Jas. E. Dupree, president, Marysville, Wash. Mine office: Silverton, Snohomish Co., Wash. Lands, 11 claims, showing a contact vein between diorite and conglomerate, ores carrying gold, silver, copper and lead. Presumably idle.

IMPERIAL MONTANA COPPER MINING,**MONTANA.****SMELTING & WATER POWER CO.**

Dead, 1903. Resurrected, circa 1904, as Bornite Copper Co.

IMPERIAL PAINT & COPPER CO.**CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Otto Woehler, superintendent. Mine is developed open-cast, and has steam power.

IMPERIO COPPER CO.**MEXICO.**

Office: Tucson, Ariz. Lands are said to be near Imperio, Sonora, Mexico, which is not a postoffice.

INCA MINING & MILLING CO.**IDAHO.**

Office: Colfax, Idaho. Mine office: Cuprum, Washington Co., Idaho. M. O. Reid, superintendent, at last accounts. Property is the Mineral World mine, carrying auriferous and cupriferous silver-lead ores.

INDEPENDENCE COPPER & GOLD MINING CO.**UTAH.**

Office: care of E. O. Leatherwood, secretary-treasurer, Salt Lake City, Utah. Chas. Park, president; E. R. Morgan, general manager. Organized 1904, with capitalization \$50,000, shares 10 cents par. Lands, 7 claims, in the Little Cottonwood district of Salt Lake county. Presumably idle.

INDEPENDENCE MINE.**MONTANA.**

An idle and slightly developed property, on the Tobacco Plains, near Kalispell, Flathead county, Montana, claimed to show a 25' vein carrying 8% copper and \$4 to \$10 gold per ton.

INDEPENDENCE MINING CO.**COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Ores carry copper and gold. Has steam power and employed circa 15 men, at last accounts.

INDEPENDENCE MINING CO.**IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Lands adjoin the Copper King mine, on the east, and give a promising surface showing. Company plans cutting the vein, at depth, by an 800' tunnel.

INDEPENDENCE MINING CO.**WYOMING.**

Office: care of H. O. Granberg, secretary and treasurer, 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. Employs 4 men. E. W. Honchen, president and superintendent; C. G. Peterson, vice-president; Frank Earle, consulting engineer. Organized June 28, 1904, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par, as successor of the Leighton-Gentry Mining Co. Lands, 6 claims, patented, area 120

acres, in the Battle Lake district, showing eruptive metamorphic country rocks, carrying an 11' contact vein between quartzite and diorite, opened by a 150' shaft and a 250' tunnel, showing occasional stringers of 3" to 12" width, carrying a little chalcopryite, assaying 12% copper, with small quantities of nickel and cobalt, and traces of gold and silver.

INDEPENDENCE MINING & SMELTING CO.**MEXICO.**

Mine office; Guachinango, Jalisco, Mex. Said to have a reduction plant in operation, late in 1905.

INDEPENDENCIA MINING CO.**MEXICO.**

Office: St. Paul, Minn. Mine office: Ameca, Jalisco, Mex. C. D. O'Brien, manager. Has argentiferous copper ores, developed by a 300' shaft and a 375' tunnel.

INDEPENDENT MINING CO.**WASHINGTON.**

Office: care of Edward Peterson, 705 First Ave., Seattle, Wash. Mine office: Baring, King Co., Wash. Lands, sundry claims, on the north fork of Fortune Creek, Kittitas county, Washington, claimed by company to show 14 veins of galena, 2 gold veins, 1 cobalt vein, and an asbestos deposit, one gold vein being asserted to be 30' to 70' wide. The company claims too much.

INDÉ REDUCTION CO.**MEXICO.**

Works office: Indé, Durango, Mex. Is said to have a smelter, known as La Roca.

INDEX-BORNITE COPPER MINING CO.**WASHINGTON.**

Office: 36 Dexter Horton Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A. M. Watt, secretary and treasurer. Lands, about 3 miles from Index, show a 2' vein, carrying bornite, giving assays of 16% to 50% copper and 6 oz. to 8 oz. silver per ton. Idle.

INDEX-HORSESHOE MINE.**WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Idle some years.

INDEX INDEPENDENT MINING CO.**WASHINGTON.**

Dead. Lost lands, Jan. 1, 1905.

INDEX MINING CO.**WASHINGTON.**

Office: care of Lot Wilbur, president and general manager, Snohomish, Wash. Mine office: Index, Snohomish Co., Wash. Lands, 5 claims, known as the Miller mine, opened by tunnels of 300' and 800', showing chalcocite, bornite and chalcopryite, in a 12' vein of concentrating ore carrying a 2' paystreak of smelting ore, on the footwall, values being mainly in chalcocite and bornite.

INDEX-PEACOCK MINE.**WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A prospect, slightly developed. Idle for some years.

INDIANA-ARIZONA MINING CO.**ARIZONA.**

Mine office: Silver Bell, Pima Co., Ariz. Lands, sundry claims, in the Silver Hill Mountains.

INDIANA COPPER CO.

Office: 15 Willam St., New York. John R. Stanton, president. Lands, 1,280 acres, in Sections 21, 27 and 28, Town 51 North, Range 37 West, Ontonagon county, Michigan. Paid in, on capital stock, \$178,708. Has 2 shafts, each of 180' depth, and expended \$175,000, circa 1862-1865. Since idle.

INDIANA COPPER CO.

Mine office: Holmes, Albany Co., Wyo. Lands, 6 claims, near the Rambler mine. Idle.

INDIANA DEVELOPMENT CO.

Mine office: Silver Bell, Pima Co., Ariz. Geo. H. Smith, manager. Lands lie south of the Imperial mine, in the Silver Hill Mountains, circa 7 miles from the Arizona Southern Railroad. Country rocks are limestone and quartzite, showing contact veins carrying sulphide ores, with limestone gangue, at depth of 55' to 150'.

INDIANA MINING CO.

Office: 25 Becker Bldg., Anderson, Ind. Mine office: Medical Springs, Baker Co., Ore. John W. Messner, president and general manager; J. W. McAlpine, vice-president; W. G. Drowley, secretary; Dr. W. J. Stapish, treasurer; Dr. A. L. Cleaver, auditor; W. L. Meyers, superintendent. Organized June 18, 1903, under laws of Oregon, with capitalization \$1,500,000, shares \$1 par. Lands, 14 claims, circa 25 miles east of Baker City, also a 280-acre townsite, bought June, 1905, showing strong outcrops and carrying a contact vein, between porphyry and greenstone, showing argentiferous and auriferous copper sulphides, with quartz gangue, averaging 2% to 3% copper, with occasional ore of higher grade. Main shaft is 330', with circa 2,000' of workings. Equipment includes a 3-ton Leyner hoist, good for 1,000', a 4-drill Leyner air-compressor, 8 power drills and a small electric light plant. Buildings include a 16x30' office, 40x70' shafthouse, 40' high, and a boarding-house. A precipitation plant is being built, this having 7 tanks, each 4x4x3'. Mine has about 5,000 tons of ore on the dumps, broken in development. Property is considered promising.

INDIANAPOLIS COPPER MINING CO.

Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. Lands, 14 claims, 6 miles southeast of Riverside. Has steam power.

INDIANA-SONORA COPPER & MINING CO.

Office: 99 John St., New York. Mine office: La Cananea, Sonora, Mexico. Employs 200 men. Jas. Douglas, president; Geo. Notman, secretary and treasurer; Walter Douglas, general manager; Geo. A. Laird, superintendent; R. A. Bryce, engineer. Lands, 164 pertenencias, showing country rocks of rhyolite quartzite and limestone, carrying at least four large and very irregular ore bodies, of nearly horizontal dip, main ore body showing a width of 300', and a proven length of 600', carrying chalcocite and chalcopyrite averaging about 4% copper. Development is by shafts of 400', 300', 300', 100', 200', 100', 150', and 300', and by the Llave tunnel, 1,800',

MICHIGAN.**WYOMING.****ARIZONA.****OREGON.****WYOMING.****MEXICO.**

and the Eureka tunnel, 1,200'. Mine has a total of 12,000' of workings, with circa 400,000 tons of milling ore in sight. The Llave tunnel reaches the main ore body, which lies in ground adjoining the Capote mines of the Greene Consolidated.

The mine has 7 hoists, of 25 h. p. to 150 h. p., an air-compressor, power drills, and 25 buildings, including a 20x20' carpenter shop, 25x50' machine shop, 20x40' smithy, office, laboratory, general store and dwellings.

In spring of 1906, ore-bins were being built at the mouth of the Llave tunnel, and a narrow-gauge railroad-line, to connect with the Greene Consolidated road, was being constructed, and it was planned to begin shipments shortly, to the Copper Queen smelter, at Douglas. Management is of the best, and property is regarded as likely to make an important low-grade mine.

INDIAN GROUP COPPER CO.

Has disappeared from former office, 1016-25 Broad St., New York. S. M. Biddison, president. Apparently an addled egg.

INDIAN QUEEN MINE.

MONTANA.

Mine office: Apex, Beaverhead Co., Mont. Employs circa 75 men. Is owned by the Western Mining Co., but is held, under a \$125,000 bond and lease, dated Dec. 8, 1904, by the Amalgamated Copper Co. Lands, one patented claim, area 20 acres, also a 3-acre millsite, in the Utopia district. Country rocks are granite, dolomite, and quartzite, showing 2 contact veins, between granite and limestone, averaging 8' to 10' width, developed by shafts of 150' and 220', and an 820' tunnel, with 1,600' of underground openings, estimated to show 50,000 tons of ore, with 10,000 tons blocked out for stopping. It is planned to sink the main shaft to 800' depth. Property shows nearly every commercial ore of copper, except enargite, ores being mainly chalcocite and chalcopyrite, giving average returns of circa 9% copper, 4.5 oz. silver and 40c. gold per ton. Mine was opened 1867, and has been worked since, intermittently, by leasers. Has steam and gasoline power, with a smelter, connected by tramway with the shafts. Smelter has a 30-ton 36" circular water-jacket blast-furnace, and, when operated, made matte averaging 55% copper, 27 oz. silver and 0.13 oz. gold per ton. Nearest railroad is the Oregon Short Line, 7 miles distant. Production, 1903, was about 700 short tons fine copper.

COMPAÑIA INGLESA DE MINAS.

CHILE.

Local Chilean name for the Copiapó Mining Co., Ltd.

COMPAGNIE D'INGUARÁN.

MÉXICO.

Office: Paris, France. Mine office: Inguarán, Michoacán, México. J. L. Phillips, manager. Employs circa 300 men. Is a close corporation, with capitalization 12,000,000 francs, controlled by the French branch of the Rothschild family, and a considerable proportion of the company's stock is owned by the Compagnie du Boleo. Price paid for the property was 1,500,000 pesos, Mexican, equal to \$750,000.

Lands, 185 pertenencias, area 457 acres, also 5,000 pertenencias held under concession, in the Tacambara district, lying on the plateau of the volcanc Jorullo, circa 1,600' above the plains. The mountains form a succes-

sion of rugged, almost inaccessible peaks, with ore outcrops near their crests, these having a generally east and west trend, with widths of 90' to 200'. Country rock is granite, in several stages of alteration, capped by a silicious limestone of 200' to 300' thickness. Ores of the district range 1.5% to 65% copper, with 2 oz. to 100 oz. silver and from a trace up to 1 oz. gold per ton. Ores of the Inguarán are almost exclusively sulphide, the ore body, of immense size, carrying disseminated chalcocite, chalcopyrite, and a little bornite, with granite-porphry gangue, gold values being slight, but silver values considerable. Estimates of size and value of ore bodies vary greatly, but the best authorities give an estimated average value of 3.25% copper, with about 3,000,000 tons developed. The proven depth of the ore is about 300 metres, at which depth the ore body apparently cuts off. The ore is well suited for concentration, and it is planned to put about 8 or 10 tons into 1, before smelting. The mine is opened by a 2,500' tunnel and 2 main shafts, deepest 350', levels being opened every 80'. Both ore and country rock are exceedingly firm, and the mine will require little or no timbering.

The Inguarán has steam power, and has developed circa 200 h. p., at Mata de Plantano, $6\frac{1}{2}$ miles from the mine, from a stream with an available head of 930', flowing about 80 litres per second, and fed by springs that burst forth from the foot of Mt. Jurullo, about 150 years ago, after the last eruption of that volcano.

The company has secured complete surveys and plans for building a railroad line from the mines to Zihuatanejo, on the Pacific, south of Acapulco. The route of the proposed railroad traverses a rugged country, and the line would require several years to construct. Surveys also have been made for a short line, connecting the mines with the Uruapán branch of the Mexican National railway, which is about 75 kilometres distant.

Owing to its inaccessibility, and to the fact that the property is controlled by the Rothschilds, many misleading stories have been printed regarding the Inguarán, and the popularly accepted estimates of its richness, size and productive capacity, are much exaggerated. The mine has a large body of low-grade ore, and should make a considerable producer in time, but its ores are not equal, in quantity or quality, to those possessed by several other Mexican mines. Development is proceeding very cautiously and slowly, and, at the rate of previous progress, several years will be required to make the Inguarán a producer, and it is not probable that production be attempted until rail connections are secured.

INSPIRATION MINING CO.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. John D. Coplen, manager. Lands, sundry claims, in the Globe district, developed by 2 tunnels, known as the Mercer and Woodson. Company plans building a concentrator, and planned beginning shipments to the El Paso or Old Dominion smelters, in the spring of 1906.

INTERCOLONIAL COPPER CO.

NEW BRUNSWICK.

Office: 702 Banigan Bldg., Providence, R. I. Mine office: Dorchester, Westmoreland Co., N. B. Darius L. Goff, president; T. J. Edwards, secre-

tary. Organized 1899, under laws of Arizona, and capitalization decreased, 1906, to \$2,000,000, shares \$5 par, in preferred and common shares, latter with restricted voting privileges. Lands, 250 acres freehold and 1,100 acres leasehold from the crown, showing a blanket vein carrying carbonate and sulphide ores, said to give returns of 3% to 4% copper. Has shafts of 40', 75', and 150', also a 1,500' drainage tunnel, with about 8,000' of underground openings. The reduction works include a 200-ton concentrator, leaching plant, and electrolytic refinery. Equipment includes 2 boilers, 4 engines, crusher, rolls, 15 tubular roasting furnaces, six 300-ton leaching vats and two 50-kw. dynamos. The electrolytic plant has 550 lead cathodes, and 550 lead anodes, 22x33" each, giving a plating surface of 5,000 square feet, for the deposition of electrolytic copper. Plant also includes tanks for precipitation of metal on scrap iron. The reduction plant did not prove satisfactory, machinery going wrong after making about 50 tons of fine copper. Company is out of funds, and property idle since 1904.

INTERIOR MINING & TRUST CO.**ARIZONA.**

Mine office: Wickenburg, Maricopa Co., Ariz. F. X. O'Brien, superintendent. Lands, sundry claims, in the Black Rock district, circa 16 miles east of Wickenburg. Company planned starting work early in 1906.

INTERMOUNTAIN GOLD & COPPER MINING CO.**IDAHO.**

Mine office: Pocatello, Bannock Co., Idaho. G. B. Rogers, president; Frank Ball, treasurer; G. A. Clark, secretary. Lands are the Lost Horse group, on the Ft. Hall Indian reservation, opened by a 50' shaft, said to be bottomed in good ore.

INTERMOUNTAIN MINING & INDUSTRIAL ASSOCIATION.**UTAH.**

Letter returned unclaimed from former office, care of L. J. Moser, manager, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands, 10 patented claims, area 135 acres, bought 1905, from Mystic Shrine Gold & Copper Mining Co., in the West Mountain district, showing several ore bodies, of which one, ranging from 6" to 20' width, has given average assays of circa 6.5% copper, 18.8% lead, 10 oz. silver and \$2 gold per ton, from chalcoppyrite and galena, opened by 4 shafts, deepest 200', and 8 tunnels, longest 700', with circa 3,000' of underground workings. Has steam power and is reached by the Copper Belt railroad. Company said to plan installing a mill to treat low-grade ores.

INTERNATIONAL CONSOLIDATED SMELTING & MINING CO. MEXICO.

Office: care of Dr. J. M. Bishop, president, 12 West 38th St., New York. Wm. L. Saunders, secretary. Organized January 1, 1904, by merger of Mexican Lead Co. and Guaynopa Smelting & Reduction Co. Lands of latter, 254 pertenencias, area 133 acres, in Guaynopa Cañon, district of Guerrero, Chihuahua, Mexico, show ores carrying 5% to 8% copper, with good silver values. Company was promoted by Daugherty & Albers, with the assistance of C. B. James. None of the promotions of Daugherty & Albers are regarded favorably.

INTERNATIONAL COPPER CO.**COLOMBIA.**

Office: 71 Broadway, New York. Wm. R. Townsend, president;

Arthur F. Carmody, vice-president; Wm. H. Martin, secretary and treasurer. Organized October, 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 2,300 acres, near Natagaima, Tolima, Colombia, claimed to give a good copper showing. Company apparently is merely a bluff, so far as actual mining is concerned.

INTERNATIONAL COPPER CO.

UTAH.

Merged, 1903, in Dirigo-La Sal Gold & Copper Mining Co.

INTERNATIONAL COPPER CO., LTD.

ARGENTINA.

Offices: 56, Cannon St., London, E. C., Eng. Capt. W. B. McTaggart, chairman; A. Dangerfield, secretary. Organized July 7, 1905, with capitalization £100,000, shares £1 par; issued, £25,000. Was formed to finance the Famatina Development Corporation, Ltd., having bought £20,000 debentures and £20,000 income bonds of that company, and having agreed to advance £60,000 additional, at 6%, for the erection of a smelter, if required.

INTERNATIONAL COPPER CORPORATION, LTD.

NEW CALEDONIA.

Dead. Lands sold, 1900, to Caledonian Mining Corporation.

INTERNATIONAL COPPER & GOLD CO.

COLORADO, MONTANA & MEXICO.

Office: 1122-135 Adams St., Chicago, Ills. Albert G. Beaunisme, president; A. P. Ballou, secretary and treasurer; W. C. Hermbuecher, general manager; Gad Freeman, superintendent. Organized 1899, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 149 claims, area circa 400 acres, in Routt county, Colorado, Madison and Missoula counties, Montana, and in the states of Sonora and Sinaloa, Mexico. Has a shaft of 280' in Montana, and a 60' shaft in Colorado. Ores are sulphide in Colorado, carbonate in Montana, and carbonate and oxide in Mexico. The Escalanta group, in Colorado, is undeveloped. The Montana properties are in name of Montana Copper & Gold Mining Co., and the Mexican lands are in name of Santa Fé Gold & Copper Mining Co. Both of latter named corporations are controlled, through majority stock interest, by the International Copper & Gold Co. Apparently all properties are idle. Not favorably regarded.

INTERNATIONAL COPPER MINING CO.

ARIZONA.

Office: P. O. Box 530, Hancock, Mich. Mine office: care of Carl Clausen, general manager, Bisbee, Cochise Co., Ariz. Fred. J. Bawden, president; R. Mount Beattie, secretary; Geo. H. Nichols, treasurer. Organized May 18, 1903, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. Lands, 14 patented claims, near Solomon Springs, 6 miles south-east of Bisbee, in the Warren district. Idle since birth.

INTERNATIONAL COPPER MINING & MILLING CO.

WYOMING.

Office: care of F. M. Dunn, Minneapolis, Minn. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo.

INTERNATIONAL EXPLORATION & INVESTMENT CO.

ARIZONA.

Succeeded, circa 1902, by Lady Helen Copper Mining Co.

INTERNATIONAL GOLD & COPPER CO., LTD.

ONTARIO.

Office: Mooney-Brisbane Bldg., Buffalo, N. Y. M. M. Wall, president;

G. W. Stanley, treasurer; E. F. Goff, secretary; R. E. Erdmann, superintendent; Organized under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, sundry claims in the Hastings district of Frontenac county, Ontario, developed by a 100' shaft. Presumably idle.

INTERNATIONAL GOLD & COPPER MINING CO.

Office: 62 Commercial Blk., Salt Lake City, Utah.

INTERNATIONAL GOLD-COPPER MINING CO. BRITISH COLUMBIA.

Dead. Lost lands, at Rossland, circa 1899.

INTERNATIONAL MINE.

MEXICO.

Office: care of H. E. Dugan & Co., owners, Douglas, Ariz. Lands, sundry claims, circa 15 miles south of Douglas, on the Nacozari railroad, Arizpe district, Sonora, showing a 2' to 6' quartz vein, carrying carbonate ores assaying 3% to 30% copper, 6 oz. silver and occasionally a little gold, developed by shafts of 20' to 50'.

INTERNATIONAL MINE & INVESTMENT CO.

MEXICO.

Office: care of E. F. Fisher, secretary, Douglas, Arizona. Dr. W. E. Lindley, president; J. M. French, treasurer; S. C. Morrison, superintendent. Lands, 108 pertenencias, adjoining lands of the Santa Rosa Development Co., about 4 miles from the Nacozari railroad, in the Arizpe district of Sonora, Mexico, showing oxide and carbonate ores, giving good assay values in copper, lead and silver, with small gold values. Also owns sundry mineral lands in the Mulatos district of Sonora, circa 200 miles south of Santa Rosa.

INTERNATIONAL MINING CO.

COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Geo. F. Johnstone, manager, at last accounts. Ores carry gold, silver and copper. Has steam power.

INTERNATIONAL MINING CO., LTD.

ONTARIO.

Office: care of V. E. Metzger, secretary and treasurer, Sault Ste. Marie, Mich. C. S. Beadle, general manager. Lands, 1,400 acres, known as the Brady location, lying east of the Mississagua river, in Patton and Thompson townships, 30 miles east of Sault Ste. Marie and 5 miles from Dean Lake station, Algoma, Ontario, opened by 12 test pits, deepest 24', showing a 3' vein, carrying chalcopryite, assaying 5% to 28% copper, with small gold and silver values. Idle, at last accounts.

INTERNATIONAL MINING & REFINING CO.

CHILE.

Mine office: Chafaral, Atacama, Chile. Operates a group of old mines, at Chafaral, and is developing mines in the Huantajaya district.

INTERNATIONAL NICKEL CO.

Office: 43 Exchange Place, New York. Ambrose Monnell, president; Col. Robert M. Thompson, chairman executive committee; Jas. L. Ashley, treasurer; Stephen H. B. Bell, secretary. Organized March 30, 1902, under laws of New Jersey, with capitalization \$24,000,000, shares \$100 par, half in 6% non-cumulative preferred and half in common stock; outstanding, \$3,912,626 preferred and \$8,822,661 common stock. Debentures, \$10,000,000 authorized, at 5%; issued, \$9,982,836.

Company is a securities holding corporation only, controlling, through stock ownership, the Canadian Copper Co., Vermilion Mining Co., Orford

Copper Co., Anglo-American Iron Co., Nickel Corporation, Ltd., Société Minière Caledonienne and American Nickel Works, also holding extensive stock interests in the Société le Nickel and other companies. Is commonly known as the Nickel Trust, and while not absolutely controlling the world's nickel supply, is the dominant factor in that industry, and, through the Canadian Copper Co., is a considerable producer of copper. Net earnings for the first year, ending March 31, 1903, were \$559,000, and for the fiscal year, ending March 31, 1905, net earnings were \$1,430,382, leaving, after payment of bond interest, adjustments and ample allowances for depreciation, a surplus of \$324,379. During the fiscal year 1905, borrowed money, to the amount of \$1,000,000, was repaid.

INTERNATIONAL SMELTING CO.

MEXICO.

Office: Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mexico. Capitalization \$1,000,000, shares \$1 par. Is said to plan building a smelter for various mines in the Suaqui de Batuc district, none of which are as yet on a productive basis, with operations seriously hampered by depredations of the Yaqui Indians.

INVESTORS MINING & PROSPECTING CO.

WYOMING.

Office: care of C. B. Bergquist, secretary, P. O. Box 132, Encampment, Wyo. Mine office: Rambler, Carbon Co., Wyo. Aaron Slothower, president and general manager; L. S. Niece, vice-president. Organized July 19, 1904, under laws of Wyoming, with capitalization \$1,000,000. Lands, 8 claims area circa 120 acres, in the Battle Lake district, showing country rocks of schist, diorite and quartzite, carrying a contact vein, between schist and quartzite, ranging up to 22' width, with a gossan showing some oxide and carbonate ores, changing to chalcopyrite, at a little depth. Has a 110' shaft. Idle.

INYO COPPER MINES & SMELTERS CO.

CALIFORNIA.

Office: 312 Pine St., San Francisco, Cal. Mine office: Keeler, Inyo Co., Cal. Employs 10 men. R. G. Paddock, president and general manager. T. J. Fitzsimmons, vice-president; Philip S. Montague, secretary; H. L. Wrinkle, engineer. Organized July 3, 1905, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 21 claims, area 415 acres, showing limestone, granite and grano-diorite country rocks, with porphyritic intrusions, carrying 8 contact veins, between limestone and porphyry or grano-diorite, showing a little native copper, malachite, azurite, chalcopyrite and chrysocolla, in veins of 2' to 40' width, giving average assays of 12% copper, 6 oz. silver and \$75 gold per ton. Development is by shafts of 35', 60' and 80' and by tunnels of 50' and 60'. Company plans making circa 1,500' of openings during 1906, and adding a gas hoist and power drills.

IOWA-NEW MEXICO MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Scheherville, N. M.

IRIGOYEN HERMANOS y CA.

MEXICO.

Mine office: Huetamo, Michoacán, Mexico. Produced 48.9 metric tons fine copper, in 1902.

IRISH MINES.

ARIZONA.

A group of 7 claims, in the Greenlee district of Graham county, Arizona,

said to show a vein of 10' to 15' width, carrying oxides and altered sulphide ores, with values up to 15% copper, opened by a 100' tunnel. Idle.

IRON CAP MINING CO.**ARIZONA.**

Out of business. Lands sold to National Mining Exploration Co.

IRONCLAD COPPER MINING CO.**OREGON.**

Office: care of Dr. P. L. Mackenzie, Portland, Ore. W. H. Warren, secretary. Lands, 10 claims, in the St. Helen's district of Skamania county, Washington, on which 2 veins, giving average assay values of about \$25 per ton, from copper, gold and silver, have been slightly developed. Presumably idle.

IRON CROWN GROUP.**ALASKA.**

Sundry claims, near the Hetta Mountain group, Copper Harbor, Prince of Wales Island, Alaska. Considered promising, but idle for some time.

IRON DYKE COPPER CO.**OREGON.**

Office: Erie, Pa. Mine office: Homestead, Baker Co., Ore. Employs 12 men. C. N. Conrad, president; H. G. Fink, vice-president; A. A. Clauss secretary; F. F. Curtze, treasurer; preceding officers, Geo. R. Metcalf and Davenport Galbraith, directors; Frank E. Pearce, superintendent. Organized under laws of Pennsylvania, with capitalization \$500,000, shares \$100 par. Litigation over title is said to have been adjusted. Property shows considerable ore, on the dumps and blocked out for stoping.

IRON FALLS GOLD & COPPER MINING CO.

Letters returned from former office, 713 New York Blk., Seattle, Wash.

IRON HEAD & REPUBLIC MINES**NEW MEXICO.**

Owned by Gilehrist & Dawson, Inc.

IRON HORSE MINING & MILLING CO.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Organized 1904, with capitalization \$500,000. Presumably idle.

IRON KING EXTENSION MINING CO.**ARIZONA.**

Office: 66 Broadway, New York. A Douglass, Lacey & Co. swindle.

IRON KING MINE.**ARIZONA.**

There are two Iron King copper mines in Yavapai county, Arizona. One is owned by the American Copper Co., the other by the Equator Mining & Smelting Co., each being described under its respective corporate title.

IRON KING MINE.**COLORADO.**

Office: care of F. A. Sidelinger, Old Orchard, Me. Property, in Gilpin county, Colorado, is said, by owners, to give a promising showing of ores carrying gold, silver and copper values.

IRON MASK MINE.**BRITISH COLUMBIA.**

Owned by Kamloops Mines, Ltd.

IRON MOUNTAIN COPPER CO.**UTAH.**

Said to have claims in Iron county, Utah, on which a little work, done 1902, under management of Duncan J. Frew, showed ores carrying copper, lead, silver and gold.

IRON SILVER MINING CO.**COLORADO.**

Offices: 416-40 Exchange Place, New York, and 523 Stevens Bldg., Detroit, Mich. Mine office: Leadville, Lake Co., Colo. Ashley Pond, president;

W. R. Cobb, vice-president; Homer A. Hoit, secretary; Fremont Woodruff, treasurer; preceding officers, Hon. Thos. W. Palmer, Henry G. Stevens, DeForest Paine, Samuel E. Reinhardt, Anson G. McCook, Jos. Greenough and Winfield Scott, directors; Waldemar Arena, financial agent; John F. Walsh, manager. To end of 1905, paid 43 dividends, aggregating \$6,000,000, and begun 1906 on the basis of 20 cent quarterly dividends, amounting to \$400,000 yearly. Net proceeds, 1904, were \$267,035.64, and year was ended with a surplus of \$209,600.30. The Nisi Prius Consolidated Mining Co. is controlled, through stock ownership, and is leased to 3 different parties. Principal mine is opened by the Tucson shaft, 925' deep, on the eastern crest of Iron Hill, which, early in 1906, was entering a 185' ore body, previously located by diamond drilling. The Dorne shaft is operated also. Ores are mainly sulphides, carrying principal values in zinc, silver and lead. Production, 1904, was 45,805,699 lbs. zinc, 3,608,351 lbs. lead, 948,902 lbs. copper, 950,067 oz. silver, and 3,049 oz. gold. Property is well equipped and well managed.

MINA ISABEL.**MEXICO.**

Office and mine: care of Jesús M. Celaya y Ca., owners, Saric, Sonora, Mex. Is a slightly developed copper prospect, presumably idle.

ISABEL COPPER MINING CO.**WYOMING.**

Lands sold, October, 1902, to Rambler Mining & Smelting Co.

ISHPEMING & BISBEE DEVELOPMENT CO., LTD.**ARIZONA.**

Attempted organization, 1903, under this title, was not effected.

ISLAND CITY COPPER MINING CO.**WYOMING.**

Office: Eaton Rapids, Mich. Letter returned unclaimed from former mine office, Saratoga, Carbon Co., Wyo. Idle and apparently moribund.

ISLAND MOUNTAIN CONSOLIDATED COPPER CO.**CALIFORNIA.**

Lands, 7 claims, in Trinity county, near the Mendocino county line, California, opened by a 490' tunnel and by several open-cuts, showing a vein ranging up to 130' width and traced for about 800', capped by large boulders carrying copper and iron sulphides. Property considered promising. Idle.

ISLE ROYALE CONSOLIDATED MINING CO.**MICHIGAN.**

Succeeded, March, 1899, by Isle Royale Copper Co.

ISLE ROYALE COPPER CO.**MICHIGAN.**

Office: 303-199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Employs circa 400 men. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; preceding officers, Clarence H. Bissell and Edgar Buffum, directors; Wm. J. Uren, general superintendent; James E. Richards, mine superintendent; James G. Glanville, mill superintendent; Chas. D. Hohl, chief engineer; John T. Reeder, chief clerk and purchasing agent; H. D. Haddock, clerk; Edward Colenso, chief mining captain.

Organized March, 1899, under laws of New Jersey, as a consolidation of the Isle Royale Consolidated Mining Co. and the Miners' Copper Co., with capitalization \$3,750,000, shares \$25 par. Annual meeting, first Wednesday in April, at Jersey City. The Isle Royale Copper Co. owns \$50,000 stock in the Lake Superior Smelting Co.

Lands, 3,240 acres, and an 80-acre millsite, including the old Isle Royale, Grand Portage and Huron mines, the Dodge and Frue prospects and sundry undeveloped lands, with an option on the mineral rights of the Montezuma tract of about 250 acres, lying next west. Lands include all of Sections 1, 2 and 11, and part of Sections 3, 9, 10 and 15, in T. 54 N., R. 34 W., also 160 acres in 6-54-33; 40 acres in 31-55-33 and 160 acres in 36-55-34, giving a compact tract carrying circa $2\frac{1}{2}$ miles of the strike of the lodes.

The three old mines included in the present Isle Royale tract made 24,226 tons, 590 lbs. fine copper, of which the Huron furnished 17,883 tons, 225 lbs., the Isle Royale 4,602 tons, 71 lbs., and the Grand Portage 1,741 tons, 294 lbs. These products were secured under primitive conditions, and at a loss of about \$2,500,000. The old Isle Royale and Grand Portage mines were opened in 1853, and the Huron in 1855. The history of all three is given in detail in Vol. I.

The Isle Royale has 3 parallel amygdaloida beds, with strike of N. 32° E. and dip of 56°, of which two have been extensively opened, these being the Isle Royale and Portage, the latter lying approximately 200' west of the former. The new shafts are on the Isle Royale lode, but the Portage bed is opened on many levels by crosscuts. East of the amygdaloids is the "Mabbs vein," lying near the Eastern Sandstone, 4' to 7' wide and rich in mass and barrel copper, but deficient in stamp rock. It was opened to a depth of about 250', by John and Austin Mabbs, circa 1875, but has not been reopened by the present management. There also are unidentified and unexplored copper bearing amygdaloids lying west of the Portage, and occasional occurrences of narrow fissure veins, carrying arsenical copper ores.

No. 1 shaft, near the northern boundary, had 3 compartments and was 1,335' deep. The Portage lode, lying 150' to 220' to the westward, was reached by 5 crosscuts, on the 11th to 15th levels, inclusive, and about two miles of drifts were opened thereon. This shaft was completely gutted by fire, December, 1903, and has not been rebuilt. When working, stoping in No. 1 was about equally divided between the Isle Royale and Grand Portage beds, these amygdaloids being markedly similar in characteristics and values.

No. 2 is a 3-compartment shaft, 1,335' deep, located 2,280' southwest of No. 1. Skip-tracks are laid with 45-lb. rails. The Isle Royale lode only was stoped from No. 2, before the burning of No. 1, but since then the south drifts of No. 1, on both lodes, have been made tributary to No. 2. Concrete dams have been built across the south drifts of No. 1, at the 13th and 14th levels, holding back the mine water, and surface water is collected on the 8th level and sent to No. 2 shaft, for forking out. Several of the southern drifts have been discontinued, because approaching the old Huron mine workings, filled with water, of which no accurate maps are available. Twenty power drills are used in No. 2 shaft. Work on the Portage bed, during 1905, was of a somewhat negative nature, and was discontinued before the end of the year, owing to beginning exploratory work on the Baltic lode.

In addition to the two new shafts there are 28 old shafts, in the three old mines, and masonry dams have been built underground, at various points,

to hold back the waters in the old openings. The Isle Royale bed is 80' in extreme width, in certain levels of No. 10 Huron, the southernmost of the old shafts, and the lode is supposed to have been lost in the bottom levels, at the southern end of the Huron. The mine has about 8 miles of new openings, in addition to circa 3 miles of stoped-out openings in the old Isle Royale and Grand Portage mines, and about 5 miles in the Huron. The mine has stopes opened for three to four years ahead of requirements, and no sinking has been done since 1902.

In 1904 a new shaft was opened, on Section 11, the Isle Royale lode having been located previously by diamond drill borings. This shaft, tentatively known as No. 11, is about 7,300' southwest of No. 2, and near the center of Section 11. The shaft found but a few feet of overburden, and opened phenomenally good ground, rich in mass, barrel and stamp copper. Developments have shown that the principal values at this point favor the footwall. The drifts do not show as rich ground as the shaft, but are in ground of good average grade. The lode shows much epidote, and developments are promising. No. 11 has 2 levels, opened at 120' intervals, and carries laterals as drift-stopps, ore being shipped as mined, with a daily production of about 30 tons. Equipment includes a temporary hoist and an 8-drill air-compressor. A shaft was started, 1904, on Section 10, but was discontinued because of the heavy overburden encountered, and a diamond drill substituted, the drill-cores showing an amygdaloid, about 5' of which carries stamp copper in fine grains.

Exploratory work on the Baltic lode was begun October, 1905, on Section 12. In July, 1906, this shaft was down circa 300', but for its entire depth was in a badly disturbed formation, barren of copper. It is hoped that at greater depth the formation may grow more settled, in which probable contingency, copper values may be anticipated with reasonable assurance. Equipment at the Baltic shaft is of a temporary nature only.

Shafts Nos. 1 and 2 have duplicate equipments, with combination shaft-rockhouses, 44x60' on the ground, and 90' high, fitted with 18x24" and 13x20" Portage Lake crushers. Each shaft has a 3,000-ton coal-trestle and a 35-drill Nordberg two-stage air-compressor. The engine-houses are 50x90', of steel on stone foundations. The hoists have 18' 6" drums, with lathe-turned grooves for 6,000' of 1½" steel cable, built to hoist 6-ton skips from a depth of 6,000'. Boiler-houses are 44x72', with 16x72' coal-storage additions, each housing three 150-h. p. 84" horizontal Burt boilers. The 40x60' machine shop, of steel on stone foundations, is well equipped. A dam, 300x500' in area and 6' deep, impounds feed-water for boilers. There are about 100 good dwellings, mostly new, on the company's lands.

The Isle Royale Railroad, owned by the company, connects the mine and mill with 4 miles of main line having easy grades, and is equipped with one 35-ton and one 55-ton locomotive, and forty 40-ton steel rock-cars having air-brakes.

The millsite, at the mouth of the Pilgrim river, has nearly one mile frontage on Portage Lake. The mill, 134x210', of steel frame on stone

foundations, has three 2,000-ton rock-bins and three 500-ton Nordberg stamps with circular mortars and $\frac{3}{8}$ " screen openings. Each stamp has 32-ton mortars, resting on anvil blocks bedded on 20x20' platforms, 3' thick, of 14x24"x20' oak timbers. Underneath each platform is a caisson, reaching to bedrock, made of 5-16" boiler steel, 74' long, and 12' in diameter, until near the top, where there is a bell-shaped flare, 20' in diameter, to support the oak platforms under the anvil blocks. The caissons and spaces between are filled with concrete. The dressing floor has 72 rough jigs and 30 finisher jigs, of the Parnall-Krause type, slime-tables, and 1 Bartlett and 2 Wilfley concentrators to treat the slimes from the circular tables. There is a complete machine-shop on the second floor of the mill. A 750-h. p. engine runs the mill and shop, taking steam from four 250-h. p. boilers, in a 46x72' boiler-house at the rear of the mill. During 1904 new crushers with fixed bearings were installed, to regrind the coarse gravel escaping from the mortars. One head was compounded, with superimposed cylinders, March 1, 1905, and results are said to be satisfactory. In addition to rock from its own mine, the Isle Royale mill stamps the production of the Ahmeek mine. A 32x600' wharf, at the millsite, with deep water alongside, has appliances for unloading coal and general freight, and for dispatch of mineral, in scows, to the smelters at Dollar Bay, 2 miles across Portage Lake.

Water is furnished the mill by a 16,000,000-gallon Nordberg Corliss pump, especially designed to handle muddy water, having a triple discharge into a 30" riveted steel water-main running 2,200' from pump-house to mill, the pump being located some distance from the mill, to obviate stamp-and clogging the intake. Three 100-h. p. boilers furnish power for the pumps, fuel being taken from a large coal-trestle at the rear of the pump-house boiler-rooms, feed-water coming from a dam near the mill.

Production, 1902, was 3,569,748 lbs. fine copper, in 1904, 2,442,905 lbs., and in 1905, 2,973,761 lbs. Cost of copper made was 11.83 cents per pound in 1903, 13.3 cents per pound in 1904, and 12.76 cents per pound in 1905. Production of fine copper, per ton of rock stamped, was 11.7 lbs. in 1901; 13.5 lbs. in 1902; 15.8 lbs. in 1904 and 15.2 lbs. in 1905. Milling costs were but 24.77 cents per ton in 1905, and total mining and milling costs for 1905 were only \$1.40 per ton—a very creditable achievement.

The Isle Royale has proven a disappointment, but by virtue of ample resources, including a large cash surplus, a magnificent equipment, and prudent management, remains a producer, and with copper at a high price, can and does earn small profits. The hope of a prosperous future lies mainly, however, in the discovery and development of richer mines than those yet opened. The policy of the management in continuing production from the old mine, and persistently seeking a newer and better mine, is the only correct one.

ISLE ROYALE LAND CORPORATION, LTD.

MICHIGAN.

Offices: 24, North John St., Liverpool, Eng. Local office: care of Rufus R. Goodell, agent, Houghton, Houghton Co., Mich. Reginald Young, chair-

man; John Tibbs, secretary. Organized June 21, 1890, as Wendigo Copper Co., Ltd., and name changed to present title July, 1901. Capitalization £225,000, shares £5 par, in 2,000 first preference, 1,089 second preference and 41,911 ordinary shares. Preference shares, all issued and fully paid; 34,504 ordinary shares issued, £4 paid in. Lands, 83,720 acres, mainly copper-bearing, upon the northern fold of the Keweenaw syncline, on Isle Royale, Lake Superior, Michigan, comprising the major portion of the area of this, the largest fresh water island of the globe. Considerable mining, of a rather desultory nature, has been done upon these lands, at various periods in the past, and some copper secured. Idle since 1892.

ITMAY MINE.**WYOMING.**

Office: care of I. C. Miller, Rawlins, Wyo. Mine office: Rambler, Carbon Co., Wyo. Albert Bryle, superintendent. Lands, sundry claims, circa 4 miles south of Rambler, opened by a 300' shaft, showing 8' of sulphide ore carrying occasional native copper, claimed to average 30% copper and 4% to 5% lead. Mine also has a 20' vein, carrying a 3' paystreak of high grade ore. Is said to plan building a concentrator, during 1906.

ITSUKI MINE.**JAPAN.**

Mine office: Itsuki-mura, Kuma-gori, Higo, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 5% to 6% copper, in veins interbedded in clay-slates. Production, 1900, was 1,080,163 lbs. fine copper.

IVANHOE MINE.**BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. Has a 140' crosscut tunnel. Idle at last accounts.

IVANHOE MINING CO.**UTAH.**

Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah.

IVANPAH CONSOLIDATED SMELTING CO.**CALIFORNIA.**

Dead.

IVANPAH MAMMOTH GOLD & COPPER MINING CO.**CALIFORNIA.**

Mine office: Ivanpah, San Bernardino Co., Cal. Capitalization \$2,000,000, shares \$1 par; issued, \$1,100,000. Lands, 22 claims, 12 owned outright and 10 under option, area 435 acres, 12 miles west of Ivanpah, claimed to show a ledge 300' wide and 6,000' long, carrying argentiferous and auriferous copper and lead sulphides, giving surface assays of \$9 to \$105 per ton, which it is planned to develop by tunnel.

JACK POT MINING & MILLING CO.**WYOMING.**

Office: care of H. O. Granberg, secretary and treasurer, 365 Tenth St., Oshkosh, Wis. Mine office: Coppertown, Carbon Co., Wyo. Employs 4 men. Ole Granberg, president and general manager; H. Thorsgaard, vice-president; J. M. Riggs, superintendent. Organized December 23, 1903, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 9 claims, area 186 acres, patented, in the Battle Lake district, showing fissure veins in diorite and chloritic schist, and 2 contact veins carrying carbonate and sulphide ores, between diorite and porphyry. Two veins are under development, one said to average 14' and the other 60' width.

The smaller vein has given average assays of 8% copper and \$3 to \$12 gold per ton, the larger vein showing very low grade copper ore. Development is by a 75' tunnel, 100' shaft and 8 pits of 20' to 36' depth, with 411' of workings. Company plans continuing development and producing 20 to 40 tons of ore daily, before close of 1906.

JACK TAR COPPER CO.**ARIZONA.**

A swindle, promoted by the notorious Wm. F. Wernse gang, of St. Louis. **JALISCO COPPER MINING CO.**

ARIZONA.

Letter returned unclaimed from former office, 135 South Broadway, Los Angeles, Cal. Mine office: Nogales, Santa Cruz Co., Ariz. A. R. Noon, president; W. J. Stevens, secretary. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 8 claims, area 160 acres, near Oro Blanco, Pima Co., Ariz. Apparently was a mere stock-jobbing device, and presumably is defunct.

JALISCO MINING & DEVELOPMENT CO.**MEXICO.**

Office care of Dennis Ryan, St. Paul, Minn. Mine office: Ahualulco, Jalisco, Mexico. Was organized, circa 1906, to take over the property of the Altamira Mining Co.

JAMAICA COPPER CO.**JAMAICA.**

Letter returned unclaimed from former office, Baltimore, Md. Organized January, 1903, with capitalization \$1,000,000. Lands, 1,000 acres, claimed by company to be heavily timbered with logwood, satinwood, ebony, cedar and walnut. Company claims that shipments of ore to England have returned 22.31% copper. Proposition is regarded with much suspicion.

JANOS MINING CO.**MEXICO.**

Letters returned unclaimed from former office, 218 New York Life Bldg., Kansas City, Mo. Mine office: Casas Grandas, Chihuahua, Mexico. A. Hanley, president; Chas. M. Lewis, secretary and treasurer. Organized under laws of Arizona, with capitalization \$1,000,000.

JAPAN-FLORA MINES & TUNNEL CO.**COLORADO.**

Office: 310 Colorado Bldg., Denver, Colo. Mine office: Telluride, San Miguel Co., Colo. T. Walter Beam, president and general manager; Wm. E. Humphreys, secretary. Organized August 22, 1903, under laws of Colorado, with capitalization \$2,000,000, shares \$1 par. Lands, 35 patented claims, area 317 acres, in the upper San Miguel district, showing 8 fissure veins, in brecciated andesite, carrying auriferous and argentiferous galena and iron pyrites, with quartz gangue, averaging about 0.5% copper, 10% lead, 8% zinc, 23.5 oz. silver and \$10 gold per ton, opened by a 685' shaft and 8 crosscut tunnels, two longest 1,600' and 2,752', with 19,655' of underground openings, estimated to give 150,000 tons of ore blocked out for stoping. Has steam and electric power, with a 45-h. p. hoist, 2 Leyner air-compressors, power drills and shops. Property has produced considerable ore. Closed down, October, 1905, and idle at last accounts.

JARILLA COPPER CO.**NEW MEXICO.**

Reorganized, 1903, as Three Bears Copper Co.

JARILLA MINING & SMELTING CO.**NEW MEXICO.**

Mine office: Jarilla, Otero Co., N. M. Lands, 20 claims, held under 5-year bond and lease, expiring 1909. Presumably idle.

JASPER COPPER CO.**CANADA.**

Office: 22 Lewis Blk., Buffalo, N. Y. Letter returned unclaimed from alleged mine office, Port Arthur, Ont. E. K. Corbett, president and general manager; Dr. F. J. Carr, vice-president; B. H. Wilson, secretary and treasurer. Capitalization, \$5,000,000. Lands, sundry claims, circa 40 miles east of Port Arthur, opened by a 40' shaft and 75' tunnel. Idle several years, and apparently moribund.

JASPER MOUNTAIN COPPER CO.**WYOMING.**

Mine office: Douglas, Converse Co., Wyo. Presumably idle.

JEFFERSON COPPER CO.

A swindle, promoted by the notorious Wm. F. Wernse gang, of St. Louis.

JEFFERSON COPPER MINING CO.**COLORADO.**

A swindle, perpetrated by the notorious W. C. Calhoun, of Denver.

JEFFERSON COUNTY MINING CO.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Organized for purpose of leasing the mine of the Basin & Bay State Mining Co. Apparently is mixed up somehow with La France Copper Co. Inactive.

JEFFERSON-MONTANA COPPER MINES CO.**MONTANA.**

Office: care of Clarence K. McCornick, vice-president and general manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Corbin, Jefferson Co., Mont. Arthur H. S. Bird, president and superintendent; C. H. Post, secretary and treasurer; preceding officers, H. A. McCornick and B. T. King, directors. Organized 1904, to take over about one-half of the Wickes and O'Connell groups, 39 claims, near Corbin. Did some diamond drilling, during 1905.

JEFFS LAND CO.**MICHIGAN.**

Office: Rockland, Ontonagon Co., Mich. Lands, 800 acres, north and west of Rockland, on which a little exploring work was done, 1899-1900. Fully described in Vol. I.

JELM TOWNSITE & MINING CO.**WYOMING.**

Office: Kasota Blk., Minneapolis, Minn. Mine office: Jelm, Albany Co., Wyo. Organized Jan. 2, 1903, under laws of South Dakota, with capitalization \$2,000,000, shares \$1 par. Idle and presumably dead.

JENNIE DELL MINING CO.**MONTANA.**

Succeeded, 1905, by Columbus-Butte Mining Co.

JEROME CAÑON COPPER CO.**ARIZONA.**

Office: 106½ South Broadway, Los Angeles, Cal. Mine office: Granite, Yavapai Co., Ariz. J. W. Tibot, president; G. B. Tibot, secretary; Jos. S. Smith, superintendent. Organized 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 16 claims, including the Copper Glance group, 14 miles northwest of Jerome, showing a vein ranging from 2' to 7' wide, with circa 1,500' of openings, ore from which has given assays up to 28% copper, 60 oz. silver and \$110 gold per ton. Has steam power, air-com-

pressor, power drills, hoist and pumps. Information refused and company apparently moribund.

JEROME COPPER CO.**ARIZONA.**

Succeeded, 1902, by Cleopatra Copper Co.

JEROME MINES DEVELOPMENT CO.**ARIZONA.**

Office: care of Lloyd C. Haynes, 20 Broad St., New York. Mine office: Jerome, Yavapai Co., Ariz. C. L. Bleakley, president; W. C. Lawrence, vice-president; J. R. Kinney, secretary and treasurer; W. J. Mitchell, superintendent. Capitalization \$1,000,000, shares \$1 par. Lands, 8 claims, area 100 acres, known as the Harryhausen group, near Jerome, on the line of the United Verde & Pacific Railroad, and lying next north of the United Verde mine. Development is by a 200' tunnel, claimed to show a 104' vein, giving assays of \$5 per ton in gold and silver, with traces of copper. Ground is being tested by diamond drilling, which is proving difficult, owing to a broken formation. It is planned to drill to depth of 1,000' or 1,500'.

JEROME SILVER-COPPER MINES CORPORATION.**ARIZONA.**

Presumably dead. Letters returned unclaimed from former office and former mine office.

JESSIE BELLE MINING, MILLING & SMELTING CO.**CALIFORNIA.**

Office: 302 Lankershim Bldg., Los Angeles, Cal. Mine office: Daulton, Madera Co., Cal. W. H. Sallada, president; W. T. Carter, secretary. Organized 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Lands, 3 patented claims, area 40 acres, with a 200' main shaft showing 4 fissure veins, carrying oxide, carbonate and sulphide ores, assaying 15% to 20% copper, 6 oz. to 10 oz. silver and \$8 to \$15 gold per ton. Has steam power, air-compressor and a 30-ton concentrator. Has shipped concentrates netting \$240 to \$620 per car.

JESSIE MINES CO.**ARIZONA.**

Organized under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Claims to have lands in Yavapai county, Arizona, and has paid dividends while peddling stock, hence safely may be set down as a more than dubious proposition.

MINA JESÚS MARIA DE BAQUERÁCHIC.**MEXICO.**

An old property, once of importance, near the Lluvia de Oro mine, in the state of Chihuahua, Mexico. Ores are copper sulphides, carrying about 5 oz. silver and \$2 gold per ton.

JESÚS MARIA MINES CO.**MEXICO.**

Letter returned unclaimed from former mine office, Parral, Chihuahua, Mexico. Property includes the Jesús Maria mine, a silver property, in Parral, idle since 1902, owing to water and decreased ore values. Company also owned a copper property at San Juan de Herredia, in El Carmen district, south of Parral, also idle since 1902, presumably for similar reasons.

JICARILLA MINING & REDUCTION CO.**NEW MEXICO.**

Office: 108 La Salle St., Chicago, Ills. Mine office: Jicarilla, Lincoln Co., N. M. Geo. E. Emery, president; H. G. W. Reinhardt, secretary; Wm. A. Franklin, manager; J. L. Walsh, mill superintendent. Lands are developed

by a shaft showing gold-silver-copper ores. Has steam power and a 15-stamp mill.

J. I. C. GROUP.

MONTANA.

Office: care of E. L. Mayo, manager, Butte, Silver Bow Co., Mont. Lands, 8 claims, one mile or more north of the Jessie mine of the North Butte, said to have 5 distinct veins, with good surface showings, one of which is 7' in width at a depth of 35', carrying mainly silver values, with a little copper.

J. I. C. MINE.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Is controlled by the Amalgamated Copper Co. Lands lie east of the Belmont, and are developed by a 650' shaft, showing mainly low grade concentrating ore. Is a small producer, from above 300' depth. Installed, circa 1905, a new hoist and air-compressor.

J. I. C. MINING CO.

UTAH.

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. G. D. B. Turner, general manager; N. A. McLean, superintendent. Lands, in the vicinity of the Daly-West and Daly Judge, are developed by a 625' shaft. Is controlled, through stock ownership, by the West Quincy Mining Co.

J. I. C. MINING & MILLING CO.

ARIZONA.

Office: Idaho Springs, Colo. Chas. Peer, president; Ludwig Anderson, vice-president; A. E. Ross, secretary and treasurer; preceding officers, John Malm and John Linn, directors. Organized under laws of Colorado, with capitalization \$600,000, shares \$1 par. Lands, 4 claims, in Yavapai county, Arizona, said to show a large body of milling ore, carrying values up to \$40 per ton, and a 16" vein of smelting ore worth up to \$344 per ton, mainly in gold.

JIMULCO MINING CO.

MEXICO.

Office: care of City Brewery, San Antonio, Texas. Mine office: Otto, Coahuila, Mex. Employs about 350 men. Otto Wahrmund, president; O. S. Newell, vice-president; S. G. Newton, secretary; John J. Stevens, treasurer; E. H. Platt, superintendent. Organized 1901, under laws of Texas, with capitalization \$500,000, shares \$50 par. Is said to have authorized an increase in capital stock, March, 1906. Lands, 111 pertenencias, including the Guadalupe, Casita and Alfari mines, located in a comparatively new mining district, opened by a 300' shaft and 5 tunnels with aggregate length of 5,160'. Ores are oxides and carbonates, shipped to the Aguascalientes plant of the American Smelting & Refining Co., for reduction, giving average returns of 15% copper, 9 oz. silver and \$2 gold per ton. Has a 5-mile narrow-gauge railway from Otto to Jimulco, connecting at latter point with the Mexican Central railway. Has gasoline power. Production, 1904, was 1,693,957 lbs. fine copper, and 1905 was 3,413,735 lbs. fine copper. Is said to have paid 8 dividends, aggregating 27% on stock issued, during first half of 1906. Management seems good and property is considered valuable.

JOHN D. COPPER MINING CO.

WASHINGTON.

Merged, 1902, in Ethel Consolidated Mines Co.

JOHN DIAS MINE.

CALIFORNIA.

Property, in Section 12, T. 6 S., R. 16 E., Mariposa county, California,

is opened by a shallow shaft on a 3' vein, in schistose diabase, carrying cuprite, azurite, chalcopryrite and chrysocolla. Ore is claimed to assay \$40 per ton, in copper and gold. Idle for some years.

JOHNNY BULL COPPER MINING CO.**NEW MEXICO.**

Office: Stein's Pass, Grant Co., N. M. Moribund.

HENRY JOHNSON MINE.**NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. Idle.

JOHNSON MINES.**WASHINGTON.**

Sundry claims in the Stanaway district, Kittitas county, Washington, from which small shipments of high-grade ore were made, 1903, to Puget Sound smelters.

JOHNSTOWN MINING CO.**MONTANA.**

Property sold, 1906, to Butte Coalition Mining Co.

JOSEPHINE & CONNECTICUT MINES.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Owned by R. K. Richardson and Wm. T. Powers. Ores carry copper, silver and gold, and properties have steam power. Idle at last accounts.

JOSEPHINE COPPER MINING & SMELTING CO.**MONTANA.**

Organized 1903, to take over sundry mining claims in the Blackfoot ceded district of Teton county, Montana. Idle.

JOSEPHINE GOLD & COPPER MINING CO.**ARIZONA & UTAH.**

Office: 203 Mining Exchange, Denver, Colo. Mine office: Basin, Grand Co., Utah. Fred G. Babcock, president; Elvin J. Price, secretary. Capitalization \$15,000, shares 1 cent par, and company has an indebtedness of \$15,000, equal to its capitalization. Lands, 7 claims, area 140 acres, on Contact Mountain, in the La Sal district, claimed to show surface croppings carrying 4% to 10% copper and \$6 and upwards in gold per ton, with very slight development. Had lands in Yavapai county, Arizona, described in Vol. V, but apparently has abandoned same.

JOSIE GOLD & COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, 261 Columbus Ave., Boston, Mass. Mine office: Houghton, King Co., Wash. E. B. Robinson, general manager, at last accounts. Organized under laws of Washington, with capitalization \$2,500,000, shares \$1 par. Lands, 12 claims, in the Snoqualmie district, circa 35 miles from Seattle, opened by several shallow shafts and short tunnels, showing ore of fair assay value.

MINA LE JOYA.**SPAIN.**

Office: care of Don Manuel Vázquez López, owner, Huelva, Spain. Mine office: El Cerro, Huelva, Spain. Lands, 53 hectareas, showing large quantities of cupriferous iron pyrites, carrying an average of 48% sulphur. Has a 10-kilometre tram, and was developing and producing on a small scale, at last accounts.

JUAREZ MINING CO.**MEXICO.**

Office: care of E. J. Snyder, secretary, Utica, N. Y. Mine office: Altar, Sonora, Mexico. Chas. Bailey, president; F. M. Penney, vice-president; Miss Belle McKinnon, treasurer; Con O'Keefe, general manager. Organized

1906, as a reconstruction of the Sonora Mining & Milling Co. Present property is a gold mine only, with about 2 miles of openings.

JUDAS MINE.

WYOMING.

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Lands, sundry claims, near the Doane mine, opened by a 50' shaft, said to show copper ore.

MINA JUEZ.

MEXICO.

Office and mine: Ameca, Jalisco, Mexico. José Somerla, owner.

JUMBO MINE.

BRITISH COLUMBIA.

Mine office: Rossland, Yale district, B. C. Mine shows a vein ranging up to 30' and more in width, developed both underground and open-cast, with ores carrying from \$7 to \$20 per ton in gross values. Has steam and electric power, air-compressor, etc., and plans building a 6,000' aerial tram from mine to the Columbia & Red Mountain railway line. Shipped about 12,000 tons of ore to the Granby smelter, 1904, but was idle, at last accounts.

JUNCTION DEVELOPMENT CO.

ARIZONA.

Succeeded, October, 1905, by Junction Mining Co.

JUNCTION MINING CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Chas. Briggs, president; James Hoatson, vice-president; Thomas Hoatson, second vice-president; Louis W. Powell, third vice-president and general manager; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thos. F. Cole, Chester A. Congdon, Chas. d'Autremont, Jr. and Geo. E. Tener, directors; Henry B. Paull, auditor; J. C. Collins, mine foreman; E. E. Whiteley, engineer. Organized October, 1905, under laws of Minnesota, as successor of Junction Development Co., with capitalization \$3,000,000, shares \$10 par; issued, \$2,500,000. Of the issued stock, 150,000 shares were given shareholders of the Junction Development Co., at the rate of three shares for one, and 100,000 shares were sold, shareholders of the Junction Development Co. subscribing for entire stock issue. Merchants & Miners Bank, Calumet, Mich., registrar. Annual meeting, second Monday in April. Is very closely allied, in ownership and management, with the Calumet & Arizona, Lake Superior & Pittsburg, Pittsburg & Duluth and Calumet & Pittsburg mining companies, and is to be merged, by means of a securities holding corporation, with four last named properties.

Lands, 18 claims, area 185 acres, patented, lying an eighth to a quarter mile southeast of Sacramento Hill, a 300' gossan blossom which is the keystone to the semi-circular copper measures of the proven portion of the Bisbee basin. The Junction has the Copper Queen and Calumet & Pittsburg to the west, and the Calumet & Pittsburg to the south. The major portion of the Junction tract is covered by the Bisbee conglomerate, flanked on either side by porphyry and limestone. It was the theory of the Junction management that the limestone underlaid the conglomerate, in which contingency the chances of finding large and rich copper ore bodies were excellent. Acting upon this hypothesis, considerable diamond drilling was done, and two ore bodies were located, by means of these borings, at a depth of about 820'. Permanent de-

velopment is by a 4-compartment shaft of 1,037' depth, sunk on the boundary line of the Junction and Calumet & Pittsburgh, and to be used jointly by these properties. Connection has been made with the Briggs shaft on the 910' level, formerly called the 770' level of the Junction, shaft of the latter being 140' below the collar of the Briggs shaft. The drift connecting these shafts showed leached ore in considerable quantities, presaging large ore bodies of good ore at greater depth. The north drift on the 910' level has cut some rich carbonate ore, and the east drift of 500', on the same level, is in leached ore carrying rich carbonate stringers for practically its entire length. The shaft is to be deepened, and levels opened, sinking having been delayed by the necessity of providing for the handling of an immense volume of water, which heretofore has been pumped by the deeper Briggs shaft. The pump station, on the 910' level, has four 800-gallons pumps, which were forking circa 2,700 gallons per minute, early in 1906.

The shaft, has a 75' steel gallows-frame, for 5 compartments, and the permanent hoist was installed early in 1906. This is a Nordberg engine, similar in plan to, but smaller than, the hoists at No. 5 shaft of the Tamarack mine, the deepest shaft of the world, and is a duplicate of the new hoist at the Oliver shaft of the Calumet & Arizona, these being the most powerful in Arizona. The hoist has four 20x48" cylinders, and is good for 3,000' depth. The machinery plant, located at the mouth of the shaft, is of 1,500 aggregate horse-power, including also minor hoists with 12x14" and 12x15" cylinders, and two cross-compound air-compressors, of 12 drills aggregate capacity. Fuel is crude petroleum, stored in three 5,000-gallon tanks. The mine is served by a short spur of the El Paso & Southwestern railway, and has the great advantage of close connection with other developed and developing mines, in the immediate neighborhood, and enjoys a management that stands deservedly high for experience, ability, financial strength and absolute honesty.

JUPITER MINING CO.

WYOMING.

Office: Tomah, Wis. Mine office: Holmes, Carbon Co., Wyo. Dr. C. E. Quigg, president; J. A. McKay, vice-president; J. W. Hancock, secretary and treasurer. Lands, sundry claims, adjoining the New Rambler, on the southwest. Idle at last accounts.

JURA-TRIAS COPPER CO.

NEW MEXICO.

Office: Commercial Club Bldg., Albuquerque, N. M. Mine office: Señorito, Sandoval Co., N. M. Thos. J. Curran, president; Geo. W. Stubbs, secretary and treasurer. Organized October, 1900, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par. Lands, sundry copper claims and a gold mine, located circa 35 miles from a railroad, showing large bodies of low-grade ore, giving average assays of 3.8% copper. Has a 25-ton smelter and has been experimenting with a new reduction process.

JUSTICE MINING CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. Lands, sundry claims, carrying ores of gold, silver and copper. Presumably idle.

KAFUE COPPER DEVELOPMENT CO., LTD.**RHODESIA.**

Offices: Salisbury House, London, E. C., Eng. Tom Donald, secretary. Organized May 31, 1905, with capitalization £350,000, shares £1 par; issued, £200,007. Lands include the Hippo mine, area 160 claims, 2 farms, area 3,000 acres, and 3 areas of 10 square miles each, all on the Kafue river, in northern Rhodesia.

KAUFE COPPER SYNDICATE, LTD.**RHODESIA.**

Absorbed, 1904, by Rhodesia Copper Co., Ltd.

KAFVELTORPS KOPPARVERK.**SWEDEN.**

In Orebro Län, Sweden. Output, 1901 was 112,590 kgs. of matte averaging 72% copper, (equal to 178,713 lbs. fine copper), and 16,423 kgs. refined copper, giving a net production, 1901, of 214,919 lbs. fine copper, with considerable values in lead and silver, obtained as by-products.

KALAMAZOO COPPER MINING CO.**COLORADO.**

Office: 232 West Cedar St., Kalamazoo, Mich. Letter returned unclaimed from former mine office, Encampment, Wyo. H. E. Brown, president; E. S. Drury, vice-president; Edwin Gillis, secretary and general manager; W. C. Carson, treasurer. Organized April 11, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 10 patented claims, area 95 acres, in the Pearl district of Larimer county, Colorado, carrying 2 fissure veins, opened by 28' and 40' shafts, showing oxide and sulphide ores assaying 2% to 50% copper, with variable values in gold, silver, nickel and zinc. Is under same management as the Coldwater mine, adjoining, and is permitting the Coldwater to develop to the boundary line. Idle for several years.

KAMIOKA MINE.**JAPAN.**

Owned by Mitsu Bishi Gossshi Kwaisha.

KAMLOOPS MINES, LTD.**BRITISH COLUMBIA.**

Offices: 18, Leadenhall St., London, E. C., Eng. Mine office: Kamloops, Yale district, B. C. Employs 65 men. G. P. Symons, chairman; J. Morrish, manager and secretary; Jos. Argall, general manager. Organized February 22, 1905, as successor of British Columbia Exploration, Ltd., with capitalization £135,000, shares £1 par; paid in, £119,433. Lands, 7 claims, in the Kamloops district, and 5 claims in the Frederick Arms district. Property includes the Iron Mask mine, having a 600' main shaft, with circa 1 mile of underground workings, showing a considerable body of chalcopryite, associated with magnetite, mainly of concentrating grade, carrying fair values in copper, silver and gold. Mine equipment includes a 250-h. p. tandem-compound condensing engine.

The reduction plant includes a concentrating mill and smelter. The mill, of 160 tons daily capacity, receives ores by aerial tram. Ore is screened on grizzlies, and coarse stuff passed through a 10x16" Jenckes-Farrel crusher, going thence to ore-bins, whence crushed ore is fed to coarse rolls by 2 automatic feeders, going thence through intermediate rolls and being elevated to 2 series of trommels. Sized material from the trommels is concentrated on Hartz jigs. Tailings from finer sizes are run to waste, while tailings from coarse jigs and oversize from trommels are recrushed by fine rolls and returned

to the elevators. Fines from trommels pass through 3 magnetic separators, for removal of the magnetite gangue. Sands are concentrated on 3 Buss tables, and middlings from these go to the Overstrom tables. Slimes run to a series of settling tanks, products of which are concentrated on 6 Luhrig van-ners, arranged in pairs. The smelter, completed July, 1905, is of 50-ton capacity only, planned as the first unit of a larger plant. Property has a good management and is considered promising.

KANGAROO HILLS MINING & SMELTING CO. AUSTRALIA.

A consolidation of the Macaulay Creek Silver & Copper Mines and the Mt. Theckla Copper Mine, in the Kangaroo Hills district of Queensland. The Mt. Theckla, opened 1900, produced 23 tons of copper and 6,315 oz. silver, 1901, from ores averaging 16% copper, 15% lead and 49 oz. silver per ton. Has a smelter, located on the Running river, midway between the mines. Presumably idle.

KANSAS-BURROUGHS CONSOLIDATED MINING CO. COLORADO.

Letter returned unclaimed from former office, Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

KANSAS CITY COPPER MINING & SMELTING CO. COLORADO.

Office: Kansas City, Mo. Mine office: Oneco, Routt Co., Colo. Oliver W. Kroll, superintendent, at last accounts. Has steam and electric power and a 40-ton smelter. Presumably idle.

KANSAS CITY FIREMEN'S COPPER MINING & SMELTING CO.

Office: 310 Kemper Bldg., Kansas City, Mo.

KANSAS CITY GOLD & COPPER MINING & MILLING CO. COLORADO.

Incorporated, August, 1902, to develop mines in Saguache county, Colorado. No traces found of operations.

KANSAS CITY & SONORA MINING & MILLING CO. MEXICO.

Property sold, 1903, to Ures Consolidated Mining Co.

KAPUNDA COPPER MINE, LTD.

Dead. Planned to, but did not, take over the Kapunda mine.

KAPUNDA MINE. AUSTRALIA.

Office and mine: care of Varley & James, owners, Kapunda, South Australia. Mine, 50 miles north of Adelaide, opened 1842, and worked by tributors, circa 1879-1901, has 8 shafts, 2 deepest being about 450' each. Water level is 50' below surface. Vein matter and country rock are very soft. Mine has produced at least \$1,000,000 worth of copper, and carries oxide, carbonate and sulphide ores, with a little native copper, ores averaging about 18.5% in tenor.

KARANKULSKI MINE. TURKESTAN.

A small property, near Tashkent, Turkestan, operated in a crude way. **KARGALINSKI WORKS. RUSSIA.**

Office and works: Orenburg, Russia. E. O. Turner, manager, at last accounts. Latest reported production, 1899, was 680 674 lbs. fine copper.

COMPAGNIE DU KATANGA.**CONGO FREE STATE.**

Office: Rue Brederode, Brussels, Belgium. Edouard Despret, chairman; Col. A. Thys, managing director; Major A. Cambier, manager; A. J. Wauters, secretary. Organized April 15, 1901, under laws of Belgium, as a subsidiary corporation of the Belgium Congo Company, with capitalization 3,000,000 francs. Lands, 50,000,000 acres, freehold, with sundry preferential mining and railway rights. Mining property is four groups, known as the Katanga, Kambove, Kazemba and Pala, located on the left bank of the upper Lualaba river, showing auriferous copper ores. Development, in charge of Grey & Holland, African managers of the Tanganyika Concessions, Ltd., has not advanced beyond an exploratory stage, but the showing is said to be promising.

KATARSKI MINE.**RUSSIA.**

Office: care of H. Lorenz, Elizabetopol, Russia. Production, 1899, was officially reported by the Russian Government as approximately 4,765,000 lbs. fine copper.

KATHARINE ELIZABETH CONSOLIDATED MINING CO.**ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. Geo. O. Ford, president and general manager; L. O. Ford, secretary and treasurer. Organized 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, in 2 groups, near Jerome Junction, in the Mineral Point district, opened by a 175' tunnel and several shafts of 25' to 125' depth. Was out of funds and idle, at the beginning of 1906.

KAWADAYAMA MINE.**JAPAN.**

Mine office: Sanyama-mura, Oe-gori, Awa, Japan. Ore is chalcopryite, mixed with iron pyrites, averaging 4% copper, in a 2' to 4' vein in amphibolite. Production, 1900, was 14,834 lbs. fine copper.

KEARNS CONSOLIDATED COPPER MINES CO.**WYOMING.**

Succeeded April 18, 1904, by Keystone Mining & Development Co.

KEARSARGE MINING CO.**MICHIGAN.**

Absorbed, 1897, by Osceola Consolidated Mining Co.

BERG- UND HÜTTENWERKE KEDABEG.**RUSSIA.**

Office: care of Gebrüder Siemens, owners, Berlin, Germany. Mine office: Kedabeg, Elizabetopol, Russia. Property is called also the Kiadebek and Kedabenski mine. Is an old mine, reopened, 1864, by present owners, under whose management it has been a considerable producer, for four decades.

Ore occurs as irregular lenses, often of considerable size, in veins with quartz-porphry gangue, having diorite on the east and diabase porphyrite on the west, with considerable tufa. The lenses shade gradually into the country rocks, with very indistinct partings. There have been 16 different lenses developed, these ranging from 6' to 165' wide, 16' to 165' deep and 33' to 820' long. Richest ore favors the hanging wall as a rule. The ore is a mixture of covellite, chalcopryite, sphalerite, pyrite and pyrrhotite, with occasional galena, accompanied by barytes in considerable quantities, and is slightly auriferous and argentiferous, averaging 3% to 5% in copper tenor. The mine is developed almost exclusively by tunnels and the caving system of winning ore is employed to some extent. Rock is broken by Siemens & Halske electric

drills. The broken ore is assorted, on surface, into three grades, the first being smelting ore, of 7% average copper tenor, all ores of 5% or upwards being smelted. Second grade ore, of between 2% and 5% tenor, is leached, and the third grade, of 2% copper or less, is sold to the petroleum refineries at Baku, for the making of sulphuric acid, which is used extensively in the refining of illuminating oils. Wages are low, ranging from 36 to 62 cents daily, for miners, and 26 to 32 cents for trammers.

The property has two smelters, the larger being at the mines, while the smaller is at Kalakent, 8 miles from Kedabeg and circa 40 miles from Elizabethpol. The works are open, no covering being provided for any department, which seems a somewhat doubtful economy, and causes occasional explosions, in time of rain. Fuel is mainly petroleum, of which circa 20,000 tons are burned annually. This is piped 29 miles, from Dalliur, on the Trans-Caucasian railway, to Kalakent and Kedabeg. Petroleum is used for general steaming purposes, for burning bricks, and for roasting, smelting and refining copper, 2,700 lbs. of crude oil being required to produce 3,600 lbs. fine copper from ore, while weight for weight of petroleum is required to refine precipitate to blister copper. The oil burned has a specific gravity of 0.882, and contains 87.4% carbon, 12.5% hydrogen and 0.1% oxygen, with a heating value of 11,700 calories. In practice it is assumed that 54 parts of petroleum, by weight, are equivalent in heating value to 100 parts of bituminous coal, or 250 parts of wood. Petroleum is sprayed into the reverberatories under high pressure.

Ore reaches the works as about 40% lumps and 60% fines. Lumps are kiln-roasted, and raggings, of $\frac{1}{4}$ " to $\frac{1}{2}$ " size, are roasted in reverberatory furnaces, while ores under $\frac{1}{4}$ " size are roasted in Gerstenhoefer kilns. Smelting is done exclusively in reverberatory furnaces, of which there are 6, circular in form, instead of oval, as formerly, 7 metres in diameter, with a depth of charge of 1 to 1.2 metres. Hearths are laid of quartz, in layers, or crushed quartz worked into a paste with water. The first-fusion product is a matte of 25% to 30% copper tenor, an average matte carrying 28.6% copper, 36.7% iron, 19.7% sulphur, 4.06% zinc, 0.85% nickel and cobalt combined, 0.10% lead, 0.05% arsenic, 0.025% silver and 0.0014% gold, with small quantities of silica, sesquioxide of aluminum and barium sulphate. The first-fusion matte is broken into lumps, roasted, and blown up to blister copper of low grade, averaging 88% to 90% copper, 25 oz. silver and 1.2 oz. gold per ton, which is refined at Kalakent, product being a homogeneous copper, largely used for sheets, but less desirable for brass.

Production, 1900, was circa 4,500,000 lbs. fine copper, and for 1904 was only 2,966,720 lbs. fine copper, decline being due to gradual exhaustion of old ore bodies, which are not being replaced by new discoveries as rapidly as exhausted.

KEDABENSKI MINE.

RUSSIA.

Described under title Berg- und Hüttenwerke Kedabeg.

KUPFERKIESBERGBAU KELCHALPE.

AUSTRIA.

Mine office: Kelchalpe, Tyrol, Austria. Is a very small producer.

KELLER & INDIANA CONSOLIDATED SMELTING CO. WASHINGTON.

Mine and works office: Keller, Ferry Co., Wash. Had a reduction plant, including a 50-ton sampling mill, 50-ton lead furnace and 160-ton copper matting furnace, under construction, in spring of 1906. Water is supplied by a 4x5' flume, 1½ miles long, taking water from the Sans Poil river. Company is supposed to own mining lands also, in the vicinity of the works.

KELVIN COPPER MINING CO.

Office: 43-89 State St., Boston, Mass.

KELVIN REDUCTION CO.**ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Frank E. Sharp, superintendent. Property includes the Ray mine, and lands leased from the Big Lead Mining & Smelting Co. A 35-ton leaching plant has been built, and is operated on a secret process, invented by H. P. McIntosh. It is claimed for this system that it will do in minutes what others processes require hours to accomplish. Only carbonate ores are treated, but sulphides are said to be amenable to treatment after roasting, and the installation of a calcining plant is planned. The plant, located on Mineral Creek, 5 miles from Kelvin, is terraced, all material being handled by gravity. Power is furnished by a 125-h. p. engine and air-compressor, and the company plans enlarging the works and doing a general custom business.

KEMP-KOMAR MINING CO.**WASHINGTON.**

Mine office: Loon Lake, Stevens Co., Wash. A. W. Kemp, manager. Ores are oxide and carbonate above and sulphide in lower workings, carrying small gold and silver values, in a 12' vein with paystreak of 6" to 5'. Car-load shipments have returned 16% to 20% copper. Idle.

KEMPTON MINE.**UTAH.**

Office: care of Col. Enos A. Wall, owner, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Fred Bemis, superintendent. Lands, in the West Mountain district, carry argentiferous and auriferous lead and copper sulphides, values being mainly in lead. The mill, of circa 125 tons daily capacity, was rebuilt, 1905, and is running on ore from the Phoenix. The mill is unique, inasmuch as practically all the machinery was designed by the owner. The equipment includes a set of Wall corrugated rolls, a set of steel rolls for middlings, also invented by Col. Wall, 3 sets of Wall jigs, 2 Wall tables for concentrates, and 2 Wilsley tables.

KENDRICK & GELDER SMELTING CO.**COLORADO.**

Succeeded, 1903, by San Juan Smelting & Refining Co.

KENNEBEC MINING CO.**UTAH.**

Office: care of W. J. Craig, manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. Lands are upwards of 400 acres, lying in the Big Cottonwood district slightly developed by tunnel, and considered well located.

KENNETT MINING CO.**MONTANA.**

Mine office: Virginia City, Madison Co., Mont. W. B. Millard, general manager, at last accounts. Ores carry gold and copper. Has steam power and a 60-ton stampmill.

KENTUCKY-ARIZONA MINING, SMELTING & DEVELOPMENT CO.**ARIZONA.**

Office: 504 Kentucky Title Bldg., Louisville, Ky. Mine office: Cave Creek, Maricopa Co., Ariz. Frank Clifford, president; Wm. Votteler and P. H. McDonald, vice-presidents; Shirley M. Crawford, secretary and treasurer. Organized under laws of Arizona, with capitalization \$2,500,000, in \$250,000 preferred and \$2,250,000 common stock. Lands, circa 50 claims, in 5 groups, lying in Maricopa and Yavapai counties, including the Copper Top mine, area 430 acres, formerly held by the Lime Creek Consolidated Gold & Copper Co. The Copper Top is opened by several shafts and tunnels, and shows numerous small veins of ore, of rather low grade. The Copper Top property includes 10-ton and 60-ton smelters, built some years ago, and the larger smelter may be removed to Cave Creek. The property has shipped a little ore, averaging better than 17% copper and \$3 gold per ton, with small silver values.

KENTUCKY GULCH MINING CO.**COLORADO.**

Mine office: Tin Cup, Gunnison Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

KEREMOS COPPER MINES, LTD.**BRITISH COLUMBIA.**

Mine office: Olalla, East Yale district, B. C. Dr. A. C. Sinclair, president; E. N. Ouimette, secretary and treasurer; R. W. Northey, superintendent. Organized December, 1900, with capitalization \$1,000,000, shares \$1 par. Has a few shallow shafts and short tunnels, showing a 6' vein with 18" paystreak of mispickel, carrying 5% to 15% copper. Works a few men, summers only.

KEREMOS-PONTIAC MINES, LTD.**BRITISH COLUMBIA.**

Office: care of Wheeler & Co., 32 Broadway, New York. Mine office: Olalla, Yale district, B. C. R. W. Northey, superintendent. Lands, 16 claims, in 2 groups, opened by numerous shallow pits and several short tunnels. A 20' shaft shows a 5' vein carrying a little native copper. Property is said to have 5 ore bodies, carrying mainly chalcopryite, associated with pyrrhotite, arsenopyrite and garnetite, average assays giving 2% to 4% copper, 2 oz. to 4 oz. silver and \$2 to \$5 gold per ton. Property is idle winters, on account of heavy snowfall. Property is considered promising, but promoters are not well regarded.

KEREMOS SMELTING & REFINING CO.**BRITISH COLUMBIA.**

Dead. Outstanding stock said to possess an equity in a liquidation fund.

KESWICK SMELTING WORKS.**CALIFORNIA.**

Owned by Mountain Copper Co., Ltd.

KETCHIKAN COPPER CO.**ALASKA.**

Office: care of W. D. Lamb, secretary and treasurer, Seattle, Wash. Mine office: care of Victor Vigelius, president, Ketchikan, Alaska. Capitalization \$2,500,000, shares \$1 par. Lands, 5 claims, area 100 acres, held on 2-year bond and lease, about 3 miles east of Coppermount, Prince of Wales Island, Alaska, also 2 gold-silver claims on Kulu Island, about 2 miles from Kell Bay. Copper claims regarded as promising.

KEWEENAW ASSOCIATION.**MICHIGAN.**

Office: 33-87 Milk St., Boston, Mass. J. M. Longyear, agent, Marquette, Mich. A land corporation, owning large tracts in the upper peninsula of Michigan, a portion of the lands being on the Keweenaw copper belt.

KEWEENAW COPPER CO.**MICHIGAN.**

Office: 45 Broadway, New York. Operating office: Hancock, Mich. Chas. A. Wright president and treasurer; Spencer R. Hill, vice-president; Thomas Hoatson, second vice-president and mining director; Chas. A. Wright, Jr., secretary; John C. Shields, railway superintendent; W. W. Stockley, engineer; A. H. Sawyer, assistant engineer.

Organized March 13, 1905, under laws of Michigan, with capitalization \$10,000,000, shares \$25 par; issued, \$3,750,000, \$10 paid in. Cash on hand, Jan. 1, 1906, was \$315,683.97. Adams Trust Co., Boston, registrar; City Trust Co., Boston, transfer agent. Annual meeting, second Tuesday in February. Capitalization was purposely made much larger than the immediate requirements of the company, to provide for future growth, plan on which the corporation was formed providing for the absorption of large tracts of mineral lands, the building of a railroad, erection of mills and smelters, etc. A very considerable part of the purchase price of lands acquired has been paid by the issue of stock.

Lands, 11,550 acres mining lands, 920 acres timber lands, and 385 acres miscellaneous lands, giving total holdings of 12,855 acres, all in Keweenaw county, Michigan. Lands are in three main groups, carrying the strike of the Keweenaw mineral belt for a distance of circa 14 miles, the tract carrying practically all of the amygdaloidal and conglomerate cupriferous beds of the district, as well as many copper-bearing cross-fissures. Lands are in Town 58 North, of Ranges 27, 28 and 29 West, and include the tracts formerly owned by the Aetna, Empire, Girard, Keweenaw, Mandan, Medora Philadelphia & Boston, Resolute and Vulcan mining companies. In addition to strictly mineral lands, the company has secured sundry tracts of value for future extensive milling operations, giving large water-frontages on available harbors, and undeveloped water-powers of great prospective value. The Longyear tract, of 1,500 acres, gives, with former holdings, nearly two miles of water-frontage on either side of the Montreal river, including Fish Cove, one mile east of the river's mouth, which might be made a good harbor, by a comparatively small outlay. This frontage will be available for stampmills, and as the site of a power plant and a railroad terminal and harbor. It also includes 5 miles of the course of the river, on both banks, and, with other holdings, gives the company the entire water frontage of Mosquito Lake. It will be possible to use Mosquito Lake for a storage reservoir, by throwing a dam across its outlet, and thus developing a great water power, with a power plant at the mouth of the river. The property of the company also includes the Lac La Belle or Mendota ship canal, one mile in length, connecting Lac La Belle with Lake Superior. The canal has a 14' channel, and leads to a splendid harbor, which should be made a harbor of refuge by the federal government.

The company has a complete diamond drill outfit, and will probe its property extensively, preliminary to beginning actual mining operations. Work was started, on the Resolute property, in a search for the westerly extension of the Montreal River amygdaloid bed, which is being developed, with very promising results, on the old Delaware mine, by the Manitou Mining Co., a subsidiary corporation of the Calumet & Hecla Mining Co. This is supposed to have been located, the drill cores therefrom showing well in copper, and the drill was put at work searching for the northern extension of the Kearsarge amygdaloid bed, on the Resolute tract. The old Resolute mine had a 379' shaft, with circa 2,000' of drifts.

An office is being built at the Mandan property, this being centrally located. The Aetna mine produced 140,881 lbs. fine copper, from desultory operations, 1863-1873. In 1906 the Keweenaw Copper Co., secured control of the Washington mine, in the Mosquito Lake district.

The Keweenaw Copper Co. secured control of the Lac La Belle & Calumet railroad, and organized the Keweenaw Central Railroad Co., to rebuild and extend this line. The entire stock issue of the Keweenaw Central Railroad Co., \$350,000 is owned by the Keweenaw Copper Co. The old Lac La Belle line, only 8 miles in length, has been rebuilt, and the line extended southwest, for circa 25 miles, toward Calumet, where connections will be secured with the Mineral Range and Copper Range railroads, and possibly with a number of private railway lines, owned by various mining companies of Calumet and vicinity. The main line should be completed and in operation during the latter half of 1906. A 3-mile branch line is being built through the Mandan, Medora and Resolute properties of the Keweenaw Copper Co., and it is planned to continue this line, easterly, to the mouth of the Little Montreal river.

Mr. C. A. Wright, the president of this company, was the original promoter of the Copper Range railroad, and the Keweenaw Copper Co. is planned to stand in somewhat similar relation to the mineral interests of Keweenaw county that the Copper Range Consolidated Co. occupies toward the South Range, which includes portions of Houghton and Ontonagon counties. The development of the copper measures of Keweenaw county has been hampered greatly, in the past, by the lack of rail facilities, which are absolutely necessary to successful mining in any low-grade district. As a consequence of inadequate transportation facilities, there are no active mines in Keweenaw county, outside of the extreme southern portion, where some rich mines, such as the Mohawk, Allouez and Ahmcek, are being developed, by the aid of extensions of several of the Houghton county railroad lines. The Keweenaw Copper Co., through its railroad, the Keweenaw Central, should prove the most important factor in reviving the once important, but long decayed mining interests of Keweenaw county, and that it will prove successful in making some good mines is a prediction that may be made with reasonable certainty.

KEY CITY COPPER CO.

BRITISH COLUMBIA.

Office: care of Capt. Andrew Wasson, president and general manager, Sacramento Cal. Mine office Mt. Sicker Vancouver Isld., B. C.

F. W. McCrady, superintendent. Property adjoins the Tyee and Lenora, and is opened by tunnel. Has steam power. Presumably idle.

KEYSTONE COPPER CO.

ARIZONA.

Office: Bank of Commerce Bldg., St. Louis, Mo. Mine office: Globe, Gila Co., Ariz. G. S. Maddox, president; A. A. Aal, vice-president; Geo. A. Biddle, secretary; J. R. Finletter, general manager; Jos. C. Erman, general superintendent; John Herman, metallurgist. Organized, 1905, with capitalization \$1,000,000, shares \$1 par. Lands, 12 claims, known as the Keystone Group, formerly worked by Finletter & Harvey, lying 8 miles west of Globe, next east of the Live Oak and near the Inspiration mine. A good wagon-road is being built to the property.

Country rocks are granite and quartz-porphry, with occasional schists. Ores are mainly chrysocolla, carrying disseminated carbonates, with occasional sulphides, including chalcocite ranging 40% to 60% in tenor. East of the main workings there are surface deposits of chrysocolla, assaying 3% to 7% copper, also a conglomerate blanket vein of 4' to 12' thickness, impregnated with copper to the extent of 3% to 6%, from which values apparently can be recovered by leaching. Development is by 3 tunnels, with circa 2,000' of workings, and it is planned to sink a 3-compartment 500' shaft, for large extraction. Principal vein has a 12' ore-body, carrying a 15" paystreak averaging 22% copper and 2 oz. to 5 oz. silver per ton. Balance of vein, of concentrating grade, running 3% to 5% in copper tenor, is left standing, for mining later. No. 2 tunnel, 570' long, shows chrysocolla and carbonate ore of 4% to 24% tenor, and No. 3 tunnel, 600' long, also shows good ore. Property has furnished a small production of silicious ore, of 3% to 5% copper tenor, to the Old Dominion smelter, for converter linings.

A 25-ton experimental leaching plant was built in 1905. The system used is a modification of the Hoepfner sulphide process, and is designed for leaching chrysocolla, as well as carbonate ores, and can include sulphide ores after roasting. Ore is reduced to fines, pulped, and leached for three hours in a slowly revolving chlorination barrel. The leaching solution is cupric chloride, which is changed to cuprous chloride by the absorption of one atom of copper. The enriched solution goes to precipitation tanks, where the extra molecule of copper is precipitated upon large copper sheets, and the solution, thus regenerated to cupric chloride, is returned to the storage tank, for further use.

Grading was being done, April, 1906, for a 100-ton roasting furnace, to enable the works to treat sulphide ores also, and it is probable that the experimental lixiviation plant will be greatly enlarged. The Keystone has been a shipper since circa 1898, and is said to have been highly profitable to the former owners, Messrs. Finletter & Harvey. Production, 1899 to 1904, was 1,067 tons, netting \$37,276.98. Ores smelted have given returns of 22% to 27% copper, and early in 1906 the property was shipping low-grade silicious ores, of 3% to 5% copper tenor, to the Old Dominion smelter, for converter linings. Management is excellent, and property is considered highly promising.

KEYSTONE COPPER MINING CO.**NEW MEXICO.**

Office: Bloomsburg, Pa. Mine office: Tres Piedras, Taos Co., N. M. J. P. Rinker, superintendent. Lands, 18 claims, known as the Payroll mine, in the Bromide district, opened to depth of about 250' and showing a 20' vein of sulphide ore, said to assay 6% to 12% copper, with fair gold values. Has steam power and a 50-ton concentrator. Presumably idle.

KEYSTONE COPPER & GOLD MINING CO.**ARIZONA.**

Office: 502 Park Bldg., Pittsburg, Pa. Mine office: Wickenburg, Maricopa Co., Ariz. C. B. McLean, president; W. J. Strassburger, secretary and general manager; W. F. Wilson, treasurer. Organized 1900, under laws of Arizona, with capitalization \$1,250,000, shares \$10 par. Lands, 24 claims, in the Blue Tank and Black Rock districts, showing sulphide ore bodies. Idle for several years.

KEYSTONE COPPER SMELTER CO.**MEXICO.**

Office: 330 Drexel Bldg., Philadelphia, Pa. General Mexican office: Apartado 22, Guadalajara, Mexico. Mine office: Tapalpa, Jalisco, Mex. Robert P. Molten, president; Edward E. Cattel, vice-president and chairman of executive committee; Aubrey F. Lee, secretary; Daniel Lamont, Jr., treasurer; Theo. Breidenbach, general manager. Organized under laws of New Jersey, with capitalization \$300,000, increased, July 6, 1905, to \$500,000, shares \$1 par. Has authorized an issue of \$100,000 certificates of indebtedness, at 6% interest, redeemable December 10, 1908.

Lands, 5 groups including La Mexicana, La America and La Palma groups, also timber rights to circa 50,000 acres of adjoining lands. Principal development is on La Mexicana group, area 82 pertenencias, 15 miles west of Tapalpa, mine being developed by a 200-metre crosscut tunnel, cutting 4 veins, with circa one mile of underground opening. Veins are fissures in porphyry, averaging 5' width, and carrying auriferous and argentiferous chalcopyrite, sphalerite and iron pyrites.

The property has steam and electric power and a 30-ton mill, with 2 crushers, 2 rolls and 3 tables. The smelter has a 75-ton reverberatory furnace, turning out matte of 30% to 48% copper tenor. It is planned to add a cyanide plant for treatment of ores rich in gold. The property employs about 100 men, and seems developing along sensible lines, and the management enjoys a good local standing.

KEYSTONE MINING & DEVELOPMENT CO.**COLORADO & WYOMING.**

Office: 839 Equitable Bldg., Denver, Colo., Mine offices: Downington, Carbon Co., Wyo., and Boulder, Boulder Co., Colo. Dr. E. T. Ettinger, president and general manager; Wm. R. Klein, secretary; G. C. Aschbach, treasurer; Foster Kearns, superintendent Wyoming mine; L. Hauselman, superintendent Colorado mine. Organized April 18, 1904, under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par, as successor of Kearns Consolidated Copper Mines Co.

The Wyoming lands, area 206 acres, are on Beaver Creek, circa 12 miles south of Encampment, and the Downington townsite, 160 acres, patented. The Kearns mine is opened by a 600' tunnel.

The Colorado properties, which carry gold only, include the Smoky Hill mine, area 20 acres, partly patented; the Dirigo mine, area 60 acres, patented, and the Norumbega mine, area 40 acres, all in Boulder county. Principal development seems to be on the Colorado gold properties.

**KEY TO SUCCESS COPPER MINING, SMELTING & EXPLO- UTAH.
RATION CO. LTD., OF PIERRE, SOUTH DAKOTA.**

Office: 213 Providence Bldg., Duluth, Minn. A. R. Merritt, president; C. E. Mylen, vice-president; Geo. F. Davis, secretary; J. S. Lane, treasurer; preceding officers, H. Brown and John L. McGilvery, directors. Organized 1902, under laws of South Dakota, with capitalization \$1,500,000, shares \$1 par; issued, \$825,000. Lands, 12 claims, area 240 acres, also a 40-acre millsite, in the Beaver Lake district of Beaver county, Utah, opened by shafts of 25', 75' and 105', showing ore carrying 3% to 6% copper, with gold and silver values. Idle, but company plans resuming work, during 1906.

KEY WEST MINING CO. NEVADA.

Mine office: Bunkerville, Lincoln Co., Nev. S. W. Darling, superintendent, at last accounts. Ores carry nickel, copper and platinum. Has steam power. Presumably idle.

KHAYYAM COPPER CO. ALASKA.

Merged, circa 1904, in Omar Mining Co.

KIADEBEK MINE. RUSSIA.

Described under title Berg- und Hüttenwerke Kedabeg.

KILLINGDAL KOBBERVAERK. NORWAY.

Owned by Bede Metal & Chemical Co.

KIMBALL CREEK MINING CO. WASHINGTON.

Dead. Letters returned from all addresses.

KIN-E-CHY MINING & MILLING CO. ARIZONA.

Office: 1112 Majestic Bldg., Detroit, Michigan. Mine office: Willcox, Cochise Co., Ariz. Employs 8 men. J. George Zink, president; Geo. J. Robinson, vice-president; Fred P. Obenauer, secretary and treasurer; Gust. Becker, manager. Lands, 33 claims, area 660 acres, in 5 groups, in the Aravaipa district, showing several fair sized veins, carrying variable values in gold, silver, copper and lead. The copper group, of 14 claims, has a 7x14' shaft 72' deep, and a 150' tunnel. The gold group, of 6 claims, shows a considerable body of low-grade gold ore. Equipment includes a small steam power mining plant, and a small stamp-mill, built 1903.

KING COPPER MINING CO. OF NEVADA. NEVADA.

Office: 431 Exchange Bldg., Boston, Mass. Letter returned unclaimed from former mine office, Lovelocks, Humboldt Co., Nev. T. H. Lowe, superintendent. Property was the Anderson mine, carrying auriferous and argentiferous copper ores, slightly developed.

KING EDWARD MINING CO. ONTARIO.

Office: care of Samuel Jeffery, secretary, Calumet, Mich. Henry Fliege, president, Paul P. Roehm, vice-president; W. J. Galbraith, treasurer; Capt. Wm. F. Ashton, superintendent. Organized 1904, under laws of Ontario, with capitalization \$3,000,000, shares \$10 par. Property is some distance

east of Sault Ste. Marie, in Algoma, Ontario, developed by a shallow shaft, said to show a 25' vein of chalcopryite, from which assays of 9% copper have been secured. Idle, since early in 1905.

KING GOLD & COPPER MINING CO.**WASHINGTON.**

Office: Davenport, Wash. Mine office: Springdale, Stevens Co., Wash. J. B. Tuttle, Sr., president and general manager; J. T. McAviney, vice-president; J. B. Tuttle, Jr., secretary and treasurer; preceding officers, A. M. Campbell and G. B. M. Seager, directors. Organized June, 1900, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Lands, 9 miles west of Springdale, known as the Edna-Gladiator, carry a contact vein between diorite and quartz, opened by a 370' shaft, showing melaconite and chalcocite, of \$10 to \$35 value per ton, with silicious gangue. Equipment includes a 350-h. p. boiler, 10x11' friction hoist, 8-drill air-compressor, power drills, steam pumps, electric light plant and various engine-houses, shaft-houses, bunk-houses and ore-bins. Suit brought by dissatisfied shareholders, alleging mismanagement, was dismissed September, 1905, the court holding that allegations were not proven.

KING GOLD & COPPER MINING & MILLING CO.**CALIFORNIA.**

Letter returned unclaimed from former office, 921-185 Dearborn St., Chicago, Ills. Company advertised to give an absolutely guaranteed investment, and was stated, in Volume V of the Copper Handbook, to be managed either by fools or rascals, which statement seems fully verified by the outcome.

KINGMAN MINE.**CALIFORNIA.**

Office and mine: care of Jas. McDonald, owner, Darwin, Inyo Co., Cal. Has a 3' contact vein, between limestone and granite, carrying slightly auriferous and argentiferous cuprite, malachite and chalcopryite.

KINGMAN SMELTING & REFINING CO.**ARIZONA.**

Office: Kingman, Mohave Co., Ariz. Organized, late in 1905, to build a custom smelter, at Kingman.

KING MINING CO.**WYOMING.**

Office: Fremont, Neb. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. T. Carroll, president and general manager; J. O. Bell, secretary; J. A. Knowles, treasurer. Lands, sundry claims, on the south fork of the Grand Encampment river, slightly developed by a crosscut tunnel, showing auriferous copper ore, carrying values mainly in gold.

KING MINING CO., LTD.**BRITISH COLUMBIA.**

Reorganized, circa 1903, as Denoro Mines, Ltd.

KING PHILIP COPPER CO.**MICHIGAN.**

Office: 701-199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Winona, Houghton Co., Mich. Arthur G. Stanwood, president; Geo. P. Gardner, vice-president; preceding officers, Walter Hunnewell, Rufus R. Goodell, Chas. J. Paine, Jr., Nathaniel H. Stone and Nathaniel Thayer, directors; Edward B. O'Connor, secretary and treasurer; Dr. L. L. Hubbard, manager, Rex R. Seeber, superintendent. Organized November 13, 1905 under laws of Michigan, with capitalization

\$2,500,000, \$6 paid in. Is a close corporation, no stock having been sold publicly. One-half of the stock issue was given for lands, 35,000 shares going to St. Mary's Mineral Land Co., which also bought 20,000 shares for cash, at \$6, securing control, with holdings of 55,000 shares, leaving 30,000 shares unissued. On March 1, 1906, the company had cash on hand, \$75,778.58. City Trust Co., Boston, registrar.

Lands, 1,040 acres, in Houghton and Ontonagon counties, Michigan, main tract lying about 1 mile south of the Winona mine. The first shaft, 1,500' from the northwest corner of the tract, struck quicksand at 32', hence was changed to a drainage shaft, and a new shaft started, 75' distant. It is planned to change this vertical temporary shaft into a permanent incline shaft, at a dip of circa 70°. Shaft, 14x25', was bottomed in rock, May, 1906, at a depth of 50'. Equipment includes a 100-h. p. boiler and 6-drill Ingersoll-Sergeant air-compressor. New machinery ordered includes a 12x20' hoist, with 5' drum, good for 1,200' depth, and a 15-drill air-compressor with 18x42" cylinders. Buildings include a 21x36' frame office, warehouse, 24x62' bunk-house, 20x50' cook-house, 15x24' smithy, 28x40' boiler and engine-house, and a 16x30' change-house.

KING & QUEEN MINING CO.

MONTANA.

Office: 1007 Bessemer Bldg., Pittsburg, Pa. Mine office: Superior, Missoula Co., Mont. Employs 6 men. Nelson Weddle, Jr., president; Chas. J. Rieger, vice-president; J. F. Hinckley, secretary; H. A. Spangler, treasurer; preceding officers, B. H. Howard, J. L. Armstrong, R. W. Judkins and Dr. Geo. T. McCullough, directors; T. E. Wood, superintendent. Organized March 22, 1905, under laws of Montana, with capitalization \$1,000,000, shares \$1 par. Lands, 15 claims, partly patented, area 188 acres, also a 20-acre millsite, all well timbered, in the Spring Gulch district, showing country rocks of limestone, quartzite and shale, with 5 contact veins between quartzite and limestone, of which 2, under development, have 8' average width, and have given average assays of 6.5% copper, 16% lead and 16 oz. silver per ton, from malachite, chalcocite and chalcopyrite. Development is by a 300' shaft and 1,200' tunnel, estimated to show 4,000 tons of ore. Equipment includes an 80-h. p. boiler, 25-h. p. hoist, good for 800' depth, and a duplex 6-drill air-compressor, also a sawmill of 6,000' daily capacity, and several mine buildings. Property is 3½ miles from Northern Pacific Railroad. Was a small producer, for circa 10 years, before bought by present owners.

KING SOLOMON MINES.

BRITISH COLUMBIA.

Office: care of J. S. H. Matson, Victoria, B. C. Mine office: Cowichan, Vancouver Island, B. C. Wm. Lewis, superintendent. Organized 1904, with capitalization \$15,000, shares \$1,500 par. Lands, 4 miles from the Esquimalt & Nanaimo Railroad, on Copper Mountain, in the Helmken district, include the King Solomon and Queen of Sheba claims. Shipped 56 tons of ore, to the Tyee smelter, which returned 8.93% copper.

KING SOLOMON MINING CO.

BRITISH COLUMBIA.

Office: care of D. C. Corbin, owner, Spokane, Wash. Letter returned

unclaimed from former mine office, Greenwood, Boundary district, B. C. Lands are near the Montreal & Boston holdings of the Dominion Copper Co., Ltd. Mine produced, 1902, circa 700 tons of ore. Idle.

KING SOLOMON TUNNEL MINING CO.**COLORADO.**

Mine office: Frisco, Summit Co., Colo. James H. Myers, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Presumably idle.

KISHORN MINE.**SCOTLAND.**

Office and mine: care of Mrs. M. M. H. Stewart, Kishorn, Loch Carron, Rosshire, Scotland. Property was worked about the close of the Eighteenth or opening of the Nineteenth Century, but has remained idle since, until reopened, 1904, when a force of about 80 men was worked on development, for a time.

KITANNING COPPER MINING CO.**WASHINGTON.**

Presumably dead. Letters returned from all former offices.

KITTICoola GOLD-COPPER MINE, LTD.**SOUTH AUSTRALIA.**

Office: care of T. S. Backhouse, Glenelg, South Australia. Mine office: Reedy Creek, South Australia. The property, sometimes known as the Tungkillio mine, opened 1845, lies 34 miles northeast of Adelaide, and is held under lease from the Australian Mining Co., since 1879. Ores are rich, but bunchy, and in early days averaged 22% copper. Has two main veins, one apparently worked out, and on Baker's lode has shafts of 240' and 360'.

KITTILSLAND KOBBERVAERK.**NORWAY.**

Letter returned unclaimed by former owners, N. Kior & Co., Christiania, Norway. Mine was idle, at last accounts.

KJOLI MINES, LTD.**NORWAY.**

Offices: 4, Suffolk St., Pall Mall East, London, S. W., Eng. Mine office: Reitan, Aalen, Guldalen, Norway. Sir W. E. M. Tomlison, Bart., chairman; W. B. Pearson, secretary. Organized July 29, 1903, with capitalization £100,000, shares £1 par. Debentures, £40,000, at 6%. Property is the Kjoli group of mines, near Røros, claimed to have a 10-mile aerial tramway, and asserted to be working circa 300 men, at close of 1905.

BERGVERWALTUNG KLAUSEN.**AUSTRIA.**

Mine office: Klausen Pfunderberg, Tyrol, Austria.

GEWERKSCHAFT KLINGENTHAL-GRASLITZER**GERMANY.****KUPFERBERGBAU.**

Mine office: Klingenthal, Saxony, Germany. Erhart August Schiedt, manager. Has a 100-metre main shaft, developing chalcopryrite, and employed about 100 men, at last accounts.

KLIPKOP (NAMAQUALAND) COPPER**CAPE COLONY.****SYNDICATE, LTD.**

Voluntarily liquidated, 1904.

KNAPP MINING CO.**COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Is controlled by the National Mining & Milling Co. Lands, 9 claims, area 80 acres, known as the Big Horn group, opened by shafts of 65' and 85', showing chalcopryrite and occasional bornite. Has a 25-h. p. steam hoist.

KNICKERBOCKER DEVELOPMENT CO.**MONTANA.**

Mine office: Helena, Lewis & Clarke Co., Montana. Lands, 8 claims, a short distance north of Helena, said to show ore assaying up to 30% copper.

KNOCKMAHON MINES.**IRELAND.**

Owned by Bonmahon Copper Mines Development Syndicate, Ltd.

JAS. H. KNOWLES.**ARIZONA.**

Office and mine: Paradise, Cochise Co., Ariz. Lands, sundry claims, circa 4 miles west of Paradise, showing native copper and rich oxidized ores.

KOEI MINE.**JAPAN.**

Mine office: Tsunekanemaru-mura, Ashina-gori, Bingo, Japan. An old property, reopened 1893. Ore is chalcopryite, associated with sphalerite, iron pyrites and micaceous hematite, in a fissure vein 4' to 8' wide, with gangue of talc and hornblende. Country rock is hornblende-granite. Concentrated ore averages 13.4% copper and 4% silver. Production, 1900, was 88,495 lbs. fine copper.

KOKOMO-PIONEER MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Dumont, Colo.

KOKUSEI MINE.**JAPAN.**

Mine office: Kawabe-mura, Shonan-gori, Mimasaka, Japan. Was opened 1882. Ore is chalcopryite, associated with iron pyrites and small quantities of sphalerite, ore occurring as lenses, largest 60' in diameter, with clay gouge, in sandstone and clay-slate. Production, 1899, was 348,497 lbs. fine copper.

KOMAKI MINE.**JAPAN.**

A very old mine, located in the provinces of Ugo and Rikuchu, Japan. Annual production, according to latest returns secured, averages about 1,000,000 lbs. fine copper, and considerable gold is secured as a by-product.

KOOTENAI COPPER-GOLD MINING CO.

Office: 15 Exchange Pl., Jersey City, N. J. Incorporated November, 1902, under laws of New Jersey, with capitalization \$500,000, by Horace B. Gould, John R. Turner and Louis B. Dailey.

KOOTENAI COPPER MINING & SMELTING CO.**IDAHO.**

Letter returned unclaimed from former office, Spokane, Wash. Mine office: Port Hill, Kootenai Co., Idaho. Idle and presumably moribund.

KOPERMYN (TRANSVAAL), LTD.**TRANSVAAL.**

Offices: 237, Finsbury Pavement House, London, E. C., Eng. E. C. C. Smith, secretary. Organized October 19, 1905, with capitalization £120,000, shares £1 par; issued, £85,000. Property is the Pietersburg district, Transvaal Colony, South Africa.

KOSAKA MINE.**JAPAN.**

Owned by Fujita-Kumi & Co.

KOSK CREEK GROUP.**CALIFORNIA.**

Sundry claims near Olena, Shasta county, California. Native copper occurs in joints of the upper portion of a 200' strata of basalt, with sulphide ores below. Idle.

KREMLIN MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. D. M. Houston, superintendent. Has a 300' shaft, and was idle several years, owing to water, but has been drained through the main tunnel of the Bingham Consolidated. Is said to show a large body of concentrating ore, on the 300' level.

KRUGER COPPER & SILVER MINING CO.**MEXICO.**

Office: 50 Congress St., Boston, Mass. Mine office: Cusihiuriáchie, Chihuahua, Mex.* Edward Glines, president; Philip A. Warner, vice-president and consulting engineer; James P. Hughes, secretary; Edgar M. Parker, treasurer; Geo. W. Boyce, general manager. Organized August, 1903, under laws of South Dakota, with capitalization \$500,000, shares \$5 par. Lands, 42 pertenencias, area 140 acres, having an old 80' shaft, said to show copper carbonates and chalcocite, with associated gold and silver values. Sunk a new 100' shaft, 1905, without encouraging results. Local tradition says mine has produced some rich ore. Idle.

GEWERKSCHAFT KUHLENBERGER ZUG.**GERMANY.**

Office: Düsseldorf, Germany. Property is sundry mines in the province of Westfalen, carrying ores of silver, lead, copper, zinc and iron. Employed circa 100 men, at last accounts.

KUNE MINE.**JAPAN.**

Owned by Furukawa Mining Co.

GEWERKSCHAFT KUPFERBERG.**GERMANY.**

Mine office: Kupferberg, Bavaria, Germany. Ferdinand Kröner, agent.

KUPFERKIESBERGBAU KUPFERPLATTE.**AUSTRIA.**

Mine office: Kitzbühel, Tyrol, Austria. Ore is chalcopyrite, with quartz gangue, occurring as horizontal beds in Silurian slates. Is an old mine and a small producer.

KURILLA MINE.**AUSTRALIA.**

Owned by Wallaroo & Moonta Mining & Smelting Co., Ltd.

KUROTAKI MINE.**JAPAN.**

Mine office: Motokawa-mura, Tosa-gori, Tosa, Japan. Is a short distance only from the famous Besshi mine. Ore is chalcopyrite, first quality averaging 10% and second grade 2% to 4% copper. Beds are much contorted, principal widths and values being found in the saddles and troughs, which average about 10' thickness. Production, 1900, was 151,890 lbs. fine copper.

KURTZ-CHATTERTON COPPER MINING CO.**WYOMING.**

Succeeded by Chatterton Mining Co.

KUSAKURA MINES.**JAPAN.**

Owned by Furukawa Mining Co.

KVANANGENS KOBBERGRUBER.**NORWAY.**

Described under title Altens Kobberggruber.

LABOR CO-OPERATIVE GOLD, SILVER & COPPER MINING CO.**BRITISH COLUMBIA.**

Office: 99 Washington St., Chicago, Ills. Mine office: Golden, Koot-

enay district, B. C. Philip Chesley, president; Rev. C. E. Nylin, secretary and treasurer. Organized under laws of British Columbia, with capitalization \$150,000, shares 10 cents par. Is a deliberate swindle, operated under the garb of religion, by Parson Nylin, a Baptist preacher, who is a disgrace to the cloth, with the aid of Chesley and other accomplices.

LA CANANEAS COPPER CO.

MEXICO.

Office: care of Ehud N. Darling, secretary, 10 Wall St., New York. Mine office: La Cananea, Sonora, Mex. Fred A. Trittle, president. Organized under laws of Arizona, with capitalization \$5,000,000 shares \$5 par. Was promoted by Henry B. Clifford & Co., but management said to be now in the hands of P. Sandoval & Co., substantial bankers of Nogales, Arizona, and Nogales, Sonora, Mexico. Lands, 230 acres, including La Libertad and El Ultimatum groups, near the Greene Consolidated, having a 150' shaft, with circa 300' of workings, said to show a 15' vein of ore similar to the Puertecitos ores of the Greene Consolidated. Property considered promising, but presumably idle.

LAC LA BELLE MINING CO.

MICHIGAN.

Sold lands, 1905, for \$250,000, to Manitou Mining Co.

LA CLEDE GOLD & COPPER MINING CO.

COLORADO.

Office: Kittredge Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Ohio, Clear Creek Co., Colo. J. H. Holloway, president; I. E. Black, secretary. Organized November, 1903, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, area 80 acres, also a \$20,000 3-year bond and lease on the Ohio mine, opened by a 300' shaft and 1,200' tunnel and having steam power. The Ohio has produced about \$250,000 worth of ore, but was flooded by cutting an underground watercourse. Company also supposed to have sundry claims near Goldfield, Nevada.

LA COBRIZA MINING CO.

MEXICO.

Office: care of C. C. Stewart, El Paso, Texas. Operating office: Apartado 25, Magdalena, Sonora, Mex. Mine office: Campo Cobriza, Puerto, Altar, Sonora, Mexico. Employs 25 men. Fred C. Emery, president and general manager; W. T. Stewart, vice-president and superintendent; A. R. Taylor, treasurer. Organized June 5, 1906, under laws of Arizona, with capitalization \$250,000, shares \$1 par. Lands, 21 pertenencias, area 47 acres, in the Magdalena district, 16 miles west of Puerto, showing limestone and granite-porphry country rocks, carrying several contact veins between limestone and porphyry, with vertical dip. One vein, under development, is said to average 40' width, with a 3,000' outcrop, giving average assays of 15% copper, 10 oz. silver and \$5 gold per ton, from melaconite, malachite and chalcopryrite. Has shafts of 85' and 100', and plans pushing development and building a 250-ton smelter during latter half of 1906. Development, while promising, is entirely inadequate to feeding a smelter.

LA CORONA COPPER MINING CO., LTD.

SPAIN.

Offices: Clock House, Arundel St., Strand, W. C., Eng. Edward E. Fernandez, chairman; Harold Cossins, secretary; J. W. Richmond Lee, general manager; John E. Marshall Hall, assistant engineer. Organized

October 21, 1905, with capitalization £20,000, shares £1 par, in 4,000 ordinary and 16,000 deferred shares; issued, £16,500. Lands are 3 mines, known as Corona I, Corona II and Los Azores, in the district of Fuencaliente, Ciudad Real, Spain.

LADD METALS CO.**IDAHO.**

Office: Canterbury Bldg., Portland, Ore. Mine offices: Mineral, Washington Co., Idaho, and Landore, Washington Co., Idaho. Chas. E. Ladd, president; Samuel Peacock, vice-president and general manager; John Snow, secretary and treasurer; Geo. D. Rich, general superintendent; John Williams, mine superintendent.

Lands are in 2 groups, both in the Seven Devils district. One group of 4 claims, at Mineral, near Weiser, bought of the Consolidated Copper Co., is shipping some ore, averaging 5% copper and up to 350 oz. silver per ton. The mining property at Landore has shipped a little ore, averaging 35% copper, and ore of much lower grade has been smelted, on the ground.

Company has smelters at both Mineral and Landore. The Mineral smelter has a small water-jacket blast-furnace, burning coke. The smelter at Landore, of 60 tons daily capacity, has a 50-ton combination reverberatory and water-jacket blast-furnace, former burning wood and latter burning coke. This anomalous furnace was devised by a former superintendent, on a novel and absolutely unsuccessful plan, combining in a double stack a reverberatory and a blast-furnace, with a downward blast and a moist updraft, charging being in both furnaces, and between the two. Fuel was to have been furnished by a gas-producer consuming wet, rotten, white fir wood. The theory and practice did not correlate, hence a new superintendent was secured and the plant remodeled along more usual lines.

Smelters were closed down November, 1905, on account of poor transportation facilities, which rendered it difficult to secure flux and fuel. It was planned, however, to resume work in 1906. Property, while poorly located as to facilities for transport, is considered promising.

LA DEMOCRATA MINING CO.**MEXICO.**

Office: 17 East 4th st., Cincinnati, Ohio. Organized 1905, under laws of Arizona, with capitalization \$50,000, shares \$10 par. Apparently bears some relation to the Democrata Cananea Sonora company.

LA DICHA MINING & SMELTING CO. OF MEXICO.**MEXICO.**

Is the Mexican incorporation of the Mitchell Mining Co.

LA DURA MILL & MINING CO.**MEXICO.**

Mine office: La Dura, Sonora, Mexico. Property is on the Yaqui river, in the Sahuaripa district of Sonora. Made 150 metric tons of copper matte in 1902, and 72 metric tons in 1903. It is said that the company may be consolidated with the Bufo Mining, Milling & Smelting Co., which apparently is under the same management.

LA DURA MINING CO.**MEXICO.**

Mine office: care of Hartmann & Groff, managers, Torres, Sonora, Mex. Ores carry gold, silver, copper and lead. Has steam power and turns out product as silver-lead-copper concentrates, when working.

LADY CHELAN COPPER CO.**WASHINGTON.**

Office: 234 Hyde Blk., Spokane, Wash. Presumably moribund.

LADY ELGIN COPPER MINING CO.**MAINE.**

Had a mine at Blue Hill, Hancock county, Maine, circa 1880. Presumably dead.

LADY HELEN COPPER MINING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Pima, Graham Co., Ariz. A. J. Halter, president. Organized under laws of New Jersey, with capitalization \$1,000,000, shares \$1 par, as successor of International Exploration & Investment Co. Lands, 100 acres, in the Clark district of Graham county.

LADY POND MINE.**NEWFOUNDLAND.**

An idle property at Lady Pond, Newfoundland, last worked, circa 1900, by Newfoundland Copper Co. Now owned by Carmen Copper Mines, Ltd.

LADYSMITH COPPER MINING CO.**MONTANA.**

Office: 259 La Salle St., Chicago, Ills. Mine office: Elliston, Powell Co., Mont. Arthur J. Bamford, president; V. W. Hemala, secretary; G. F. Newberg, treasurer. Organized 1905, under laws of South Dakota, with capitalization \$400,000. Lands, 4 claims, 12 miles from Elliston, well timbered and watered. Development is by two 110' shafts, said to show ore averaging 22.5% copper. Company alleged, in its prospectus, that dividends should be paid during 1906, but of course cannot pay same from profits of operation.

NUEVA SOCIEDAD PROPIETARIA LA ESTRELLA.**SPAIN.**

Office: Granada, Spain. Property includes El Ensueño and La Jerezana mines, under option or lease to the Société Anonyme La Estrella, of Paris.

SOCIÉTÉ ANONYME LA ESTRELLA.**SPAIN.**

Office: 161, Boulevard Haussmann, Paris, France. Mine office: Los Martires, Granada, Spain. Capitalization, 200,000 francs. Don Huberto Meersmans, general manager; Don Antonio Melián, superintendent. Property includes La Jerezana, El Ensueño and other mines of copper, at Los Martires, termino del Boza, Granada, also an argentiferous copper group at Alpujarra, Granada. La Jerezana and adjoining mines were undergoing development, at last accounts.

LAFAYETTE MINING CO.**MICHIGAN.**

Wound up, 1906, and a dividend of \$2.42 per share paid stockholders.

LA FLORENCIA GOLD & COPPER CO.**MEXICO.**

Office: 30 South Ninth St., Richmond, Va. Mine office: Cos, Sonora, Mex. D. A. Ainslie, president; R. F. Hudson, secretary; Tom L. West, general manager. Organized 1902, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Lands, 134 pertenencias, area circa 330 acres, 25 miles from nearest railroad, showing a wide mineralized belt with heavy iron capping, traceable 2 miles. Main shaft, 250', with a 50' cross-cut in ore assaying 5% to 9% copper, with fair gold and silver values. Property considered valuable, but company apparently moribund.

LA FLORIDA MINING, MILLING & DEVELOPING CO.**MEXICO.**

Letter returned unclaimed from former office, Naco, Ariz. Moribund.

LA FORTUNA MINING CO.**MEXICO.**

Office: 416-27 William St., New York. Mine office: Ahualulco, Jalisco, Mexico. W. B. Stewart, president; Frank E. Lloyd, manager. Lands, 40 pertenencias, 5 miles northwest of Ahualulco, showing a 5' to 20' vein, carrying auriferous and argentiferous copper and lead ores, with quartz gangue. Is opened by tunnels, with about one-half mile of workings, showing circa 10,000 tons of ore. Has a small mill and produced circa 30 tons of ore daily, at last accounts.

LA FORTUNA MINING CO., S. A.**MEXICO.**

Is the Mexican incorporation of the Fortuna Mining Co.

LA FRANCE COPPER CO.**MONTANA.**

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Works office: Basin, Jefferson Co., Mont. F. August Heinze, president; Albert Frank, superintendent; W. A. Kidney, mill superintendent; Organized April, 1905, under laws of New York, with capitalization \$7,000,000, shares \$25 par, in \$1,000,000 preferred shares at 6%, and \$6,000,000 common shares. Bonds, \$2,000,000 authorized, at 6%.

Lands are the Lexington mine, 8 claims, area 32 acres, held under a \$250,000 bond and lease from the French owners, in the name of Louis Girard, assigned to La France Copper Co. The Lexington has a 3-compartment main shaft, of 1,450' depth, well timbered and ventilated, and connected on the 600' level with the Alice mine, with several miles of workings, but having 950' of water in the bottom, at the end of 1905, which it was planned to fork out. The mine was worked many years ago for gold and silver values, but below the 1,400' level has a 30' vein, with granitic gangue, carrying stringers of sulphide ore assaying 3% to 4% copper, and is said also to have a vein of 14' average width, giving average returns of 2.75% copper, \$4 silver and \$5 gold per ton, with considerable zinc and a little lead. Equipment includes a 15x30" Ottumwa hoist, raising a single-deck cage, to be replaced, 1906, by a 20x60" Allis-Chalmers hoist raising two double-deck cages. A 50-drill air-compressor is being installed, and the mine has two electric pumps. The mine has an old mill, idle since 1893, with circa 100,000 tons of auriferous tailings, which probably could be cyanided profitably.

The reduction plant is the old Basin & Bay State concentrator, at Basin, supposedly held under a \$600,000 bond and lease. The mill has 2 crushers, 8 sets of rolls, 4 Huntington mills, 90 Hartz jigs and 60 Wilfley tables. In April, 1906, the Lexington was producing circa 300 tons of ore daily, of which 125 tons of zinciferous ore were being sent to the works of the Montana Zinc Co., and 175 tons were going to the mill at Basin. The property has an aggressive and capable management, and is considered promising.

LAKE COPPER CO.**MICHIGAN.**

Office; Houghton, Mich. Mine office: Greenland, Ontonagon Co., Mich. Reginald C. Pryor, president; Wm. D. Calverley, secretary; preced-

ing officers, J. H. Rice, R. M. Edwards, B. F. Chynoweth and Linus Stannard, directors. Organized November 28, 1905, under laws of Michigan, with capitalization \$2,500,000 shares \$25 par. Of the capital stock, 55,000 shares were given the owners of the Belt lands, and 15,000 shares were sold, at \$3, leaving 30,000 shares in the treasury and giving a cash working fund of \$45,000. Lands, 740 acres, adjoining the Adventure, and carrying the strike of the Evergreen belt for one mile, on which considerable diamond drilling has been done. Property is the Belt mine, first opened 1848, and taken over, 1882, by the Belt Mines Co., Ltd., which corporation, by incompetence and bad management, sunk about £250,000 in 3 years, without securing as much as a half-mile of underground openings. Some exploratory work was done, 1901, under the management of Nathan F. Leopold, with Capt. Wm. A. Dunn in charge.

Operations by present company have been confined mainly to the Knowlton and Butler lodes, with a little work on a lode formerly supposed to be the Evergreen. There are shafts of 170' and 300' on the Knowlton lode, and the latter shaft is being deepened to 600', and is sinking through decidedly promising ground. There also is a 90' shaft on the Tresidder lode, circa 1,000' east of the Knowlton bed, which was sunk circa 1865, and is said to have paid for its sinking from the copper taken out.

Equipment includes a 12x15" duplex hoist and a 6-drill air-compressor. Management is good, and the plan of development is eminently sound, this calling for the expenditure of every dollar available, underground, rather than upon extensive surface improvements, which can come later, if the showing made in the mine warrants such outlay.

LAKE COPPER PROPRIETARY CO., LTD.

SWEDEN.

Office: 40, Queen Victoria St., London, E. C., Eng. Organized March 10, 1906, with capitalization £300,000, in 298,000 ordinary shares of £1 par, and 40,000 deferred shares of 1s. par. Was formed to acquire control of the Lake Copper Syndicate Aktiebolag, a Swedish corporation controlling sundry mining lands in Sweden.

LAKE GEORGE MINES, LTD.

AUSTRALIA.

Reorganized, 1904, as Lake George Successors, Ltd.

LAKE GEORGE SUCCESSORS, LTD.

AUSTRALIA.

Offices: 10, Walbrook, London, E. C., Eng. Mine office: Bungendore, N. S. W., Australia. A. J. Marks, chairman; N. R. G. Rivington, mine manager; H. R. Westall, secretary. Organized June 8, 1904, as a second reconstruction of the Lake George Mines, Ltd., with capitalization £10,000, shares 1s. par; issued, £2,940. Lands, 172 acres, freehold, at Captains Flat, Lake George, N. S. W. Has a cyanide plant and small smelter, with reserves of about 11,000 tons of ore, said to be unpayable. Mine was opened 1882, and has a depth of about 600'. Main vein is 22' to 30' wide, and very persistent, having a meridional strike and vertical dip, in a country-rock of Silurian slates. Ore occurs as replacements along fault-lines, and is a compact, fine-grained mixture of chalcopyrite, sphalerite, galena and iron pyrites, in an aluminous quartzose gangue. Ore averages about 1.5% cop-

per, with small gold and silver values, and is very refractory. Has four 60-ton water-jacket blast-furnaces, using 50% flux and 50% fuel charges, and also has tried pyritic smelting. Annual production formerly was about 500 tons of fine copper, sold as matte carrying 30% to 35% copper and about 200 oz. silver and 5 oz. gold per ton of blister copper. Present operations are confined to efforts to secure sundry monies, paid into court by the old company.

LAKE HURON COPPER SYNDICATE, LTD.**ONTARIO.**

Voluntarily wound up, February, 1901.

LAKE SHORE MINING CO.**MICHIGAN.**

Office: care of W. H. Garlick, president, Marquette, Mich. Mine office: Green, Ontonagon Co., Mich. Organized under laws of Michigan, with capitalization \$500,000, shares \$25 par. Lands, 773 acres, in 51-44, Ontonagon county, Michigan, carrying 3 copper-bearing veins, of 5', 5', and 12' width, showing oxide ore and chalcocite giving assays of 1.5% copper, 0.5 oz. silver and 40 cents to 80 cents gold per ton.

LAKESIDE GOLD-COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, Spokane, Wash. Mine office: Index, Snohomish Co., Wash. Geo. W. Weatherbee, president; A. L. Sweetser, secretary and treasurer; E. W. Berry, general manager. Capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, in the Index district. Idle.

LAKE SUPERIOR & ARIZONA MINING CO.**ARIZONA.**

Title changed, 1904, to Lake Superior & Arizona Mining & Smelting Co. **LAKE SUPERIOR & ARIZONA MINING & SMELTING CO.** **ARIZONA.**

Office: Calumet, Mich. Mine office: Florence, Pinal Co., Ariz. John D. Cuddihy, president; Dr. W. A. Holt, vice-president; Johnson Vivian, Jr., second vice-president; Wm. B. Anderson, treasurer; A. E. Petermann, secretary; J. T. Reeder, assistant secretary; preceding officers, Wm. Thielman, Angus W. Kerr, Edward Ulseth, Henry L. Baer and Thos. Maslin, directors; Alfred C. Sieboth, superintendent; Dugald Stewart, clerk; Henry Richardson, engineer. Organized Sept. 30, 1902, under laws of Arizona, with capitalization \$200,000, shares \$1 par, as the Lake Superior & Arizona Mining Co., and reorganized, 1904, under present title, with increased capitalization. Levied a \$1 assessment January, 1906, payable in installments, on the outstanding stock issue of 83,000 shares.

Lands, 110 acres, owned in fee, in the Pioneer district, known formerly as the Golden Eagle and worked for gold by the Gem Gold Mining Co., which went out of business, 1885, after paying considerable dividends. Litigation over titles was settled favorably to company, April, 1906. Property shows many shallow shafts and short tunnels, opened in a random manner, from which former owners extracted rich surface ores. The property shows 3 veins, of which 2 are under development, these being contact veins between quartzite and limestone, and averaging circa 6' width. The main vein, 6' to 7' wide, has a quartzite foot and limestone hanging wall, with dip of circa 35°, carrying auriferous and argentiferous copper ores, and showing a little free gold. Ores are mainly silicious oxides and carbonates, associated

with iron and manganese, and valuable for fluxing the base ores likely to be opened at greater depth. Shipments of 13 carloads, made 1905, from the Anderson tunnel, gave returns of 31.6% copper, 2.2 oz. silver and \$2.67 gold per ton, giving net proceeds of \$24,649.81.

Development is by one shaft and 4 tunnels. The vertical Vivian shaft, of 279' depth, sunk in low ground, cut diagonally through about 30' of ore. The Holt tunnel, of circa 500' length, has a blind shaft, known as the Holt shaft, starting 215' below surface and bottomed 675' below the outcrop, which connects with the Carlton tunnel, of circa 250' length, driven about 100' below the Holt tunnel. The mine had 9,497' of openings, at end of 1905, not including the old workings of former owners. The ground is soft, as a rule, requiring heavy timbering.

Equipment includes a good steam plant with a 175-h. p. water-tube boiler and a 16-drill Rand two-stage air-compressor having 14x24" steam cylinders and air cylinders of 13x16" and 24x16". Buildings include a power-house, smithy, bunk houses, etc., and an office and dwelling at Florence, 18 miles from the mine.

Shareholders of the Lake Superior & Arizona Mining & Smelting Co. have organized the Arizona Midland Railroad Co., capitalization \$500,000, shares \$1 par, to build a 25-mile railway between the mine, at Superior, and the Gila Valley, Globe & Northern railway, at Florence, the capitalization being for the estimated cost of the line. The company's plans call for the building of a smelter, at Florence, on the bank of the Gila river, where there is a good site and never-failing water supply. The company is expending about \$100,000 yearly, and is opening a promising mine, but the property cannot be placed on a profitable productive basis until rail connections are secured.

LAKE SUPERIOR & BISBEE DEVELOPMENT CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Idle.

LAKE SUPERIOR CONCENTRATING CO.

MICHIGAN.

Voluntarily wound up, 1905.

LAKE SUPERIOR COPPER & ZINC CO.

ONTARIO.

Letter returned unclaimed from former office, 20 Broad St., New York.

LAKE SUPERIOR GOLD MINING & MILLING CO.

MEXICO.

Office: Marquette, Mich. Letter returned unclaimed from former mine office, La Cananea, Sonora, Mex. F. H. Begole, treasurer. Capitalization \$3,500,000, shares \$5 par. Lands first held, 1,200 acres, near Magdalena, Sonora, Mexico, were abandoned, and operations transferred to a group of copper claims, area 900 acres, lying in the Cananea Mountains, Sonora.

LAKE SUPERIOR MINE.

MICHIGAN.

Lands, 640 acres, in Sections 13 and 14, Town 50 N., Range 39 W., Ontonagon county, Michigan, carrying the northeasterly continuation of the parallel cupriferous beds of the Evergreen belt opened in the Mass and Adventure mines. Long idle.

LAKE SUPERIOR & PITTSBURG DEVELOPMENT CO. ARIZONA.

Succeeded, June 1, 1904, by Lake Superior & Pittsburg Mining Co.

LAKE SUPERIOR & PITTSBURG MINING CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 275 men. Chas. Briggs, president; James Hoatson, vice-president; Thos. Hoatson, second vice-president; Louis W. Powell, third vice-president and general manager; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; preceding officers, Thos. F. Cole, Chester A. Congdon, Charles d'Autremont, Jr., and Geo. E. Tener, directors; James E. Fisher, assistant secretary; Henry B. Paull, auditor; E. E. Whiteley, engineer; Frank Juleff, mine foreman. Organized April, 1904, under laws of Minnesota, as successor of Lake Superior & Pittsburg Development Co., with capitalization \$3,000,000, shares \$10 par; issued, \$2,500,000, fully paid. Merchants & Miners Bank, Calumet, Mich., registrar. Annual meeting, second Monday in April. Ended 1905 with cash assets of \$382,870.82, and liabilities of \$584,807.24, giving a balance of liabilities of \$201,936.42.

Lands, 44 claims, area 629 acres, patented, and owned in fee, with titles perfected. The mine has 2 shafts, and at hird may be sunk later, on the southeastern part of the company's extensive tract. The principal opening is the Cole shaft, formerly known as No. 2. This was sunk nearly 1,000' by former owners, and has been straightened, retimbered and cut down from 2 small compartments to 4 large compartments of full working size, 8x24' outside of timbers, the work of remodeling having been started simultaneously on 10 levels, and performed in record-breaking time. The shaft was 1,227' deep at the end of 1905, with drifting begun on the 1,200' level. It will be sunk to 1,500' depth, and has opened drifts on the 800', 900', 1,000' and 1,100' levels, with drifting begun on the 1,200' level, in May, 1906, with the shaft approaching the 1,300' station. This shaft is connected with No. 3 shaft, on the Uncle Sam claim, some distance southward. The Cole shaft has Prescott and Cameron station pumps, caring for a present flow of 225 gallons per minute, and capable of much heavier duty. It is obvious that the Briggs shaft of the Calumet & Pittsburg is caring for considerable part of the normal water supply of the Cole shaft. Large ore bodies have been opened on the 900', 1,000' and 1,100' levels, notably the latter. The ores are similar in occurrence and nature to those of the Copper Queen and Calumet & Arizona, of which the L. S. & P. ore bodies are the southerly continuation, and the 1,100' level shows long stopes of ore ranging in copper tenor from 7% to 30%, with small gold and silver values. Development work was retarded, during 1904-1905, by the remodeling of the shaft, but is being pushed vigorously, since that necessary work was completed.

No. 3 shaft, on the Uncle Sam claim, is 1,000' deep, and will be kept in abeyance for the present. No. 1 was an old shaft of the former owners, of small size and shallow depth, and doubtless never will be used by the present management. The production of the Pittsburg & Duluth mine is through the Cole shaft, by a long drift on the 1,000' level, penetrating Pitts-

burgh & Duluth territory, and eventually connecting with the Oliver shaft of the Calumet & Arizona mine.

The main mining plant is at the Cole shaft, and includes boilers of 800 aggregate horse-power, burning petroleum, a 16-drill air-compressor and single-drum hoists with 12x14" and 12x36" cylinders. The Cole shaft is to have a Nordberg hoist, similar to that at the Junction mine, with 18x42" quadruple cylinders, and double drums, capable of raising 12-ton loads from a half-mile depth, and is to hoist triple-deck cages carrying 3-ton cars, operating in balance, or singly, as desired. This hoist will have no superior in Arizona, and few anywhere. Surface improvements include a timber-mill, smithy, office, changing-house, etc.

Production was begun October, 1905, ores going to the Calumet & Arizona smelter, at Douglas, where the use of a single furnace is shared with the Pittsburg & Duluth, the latter furnishing about one-third of the joint tonnage. At the end of 1905 the Lake Superior & Pittsburg was shipping circa 1,000 tons of ore weekly, securing therefrom average returns of better than 8% copper and 45 cents per ton gold and silver. Production, 1905, was 1,721,295 lbs. fine copper and \$5,418.23 gold and silver, the ores smelted giving returns of 8.5% copper.

The management is the same as that of the Calumet & Arizona, which has made a phenomenal success in Arizona copper mining, and is capable at all points. The Lake Superior & Pittsburg Mining Co. is to be merged, during 1906, by means of a holding company, known as the Superior & Pittsburg, with the Pittsburg & Duluth, Calumet & Pittsburg and Junction mining companies, and the company so formed must make a very profitable copper producer of great size, in the course of a few years.

LAKE SUPERIOR POWER CO.

ONTARIO.

Office: Sault Ste. Marie, Ont. Mine office: Gertrude Mine, Algoma, Ontario. C. D. Warren, president; W. N. Sawyer, general manager; A. B. Willmott, superintendent. Lands, 7 claims, area circa 2,000 acres, including the Gertrude and Elsie nickel-copper mines, in Creighton township, showing 4 contact veins, of which 2, slightly developed, carry cupriferos and nickeliferous pyrrhotite, returning an average of 0.5% copper and 3% nickel. Has shafts of 60' and 120', with circa 1,000' of underground openings, estimated by previous management to show 500,000 tons of ore, with 50,000 tons blocked out for stoping, which obviously is an overestimate. Has a steam plant with tubular boilers, 2 hoists and a 12-drill air-compressor.

Smelter, $\frac{1}{2}$ mile from the mine, and connected therewith by the Manitoulin & North Shore railway, has a 100-ton Herreshoff water-jacket blast-furnace, making, when in operation, matte with a combined copper and nickel tenor of 25%. Idle since circa 1904.

LAKE SUPERIOR SMELTING CO.

MICHIGAN.

Office: 303-199 Washington St., Boston, Mass. Operating office: Postoffice Block, Houghton, Mich. Works office: Dollar Bay, Houghton Co., Mich. Norman W. Haire, manager; Harry B. Conant, superintendent;

J. C. Dunstan, clerk; E. Kneeland, chemist; H. M. Germberger, assistant chemist. Capitalization \$1,200,000, shares \$25 par. Stock is owned jointly by the Detroit & Lake Superior Copper Co., of Waterbury, Conn., and the Tamarack-Osceola Copper Mfg. Co.

Plant includes smelters at Hancock and Dollar Bay, Houghton county, Michigan. The Hancock plant is the oldest in the Lake Superior district, and is worked intermittently, being idle since March, 1905. The Dollar Bay plant is closely connected with the works of the Tamarack-Osceola Copper Manufacturing Co., and employs circa 300 men. The Dollar Bay works have 11 reverberatory furnaces, four of 17x30' size and seven of 11x16' size each. One of the larger furnaces has a mechanical ladling and casting device, and the three other larger furnaces are to have similar equipments, which will enable the four large furnaces to do all smelting for the plant, putting the seven smaller furnaces out of commission. The mechanical ladling and casting device has a 1,100-lb. ladle and a casting machine with moulds linked into an endless belt, dumping over sprockets into cooling tanks, whence the ingots are removed mechanically by cleat elevators, which deliver the ingots to inspection and loading platforms. On the return of the moulds, while inverted, they pass over a rosin fire, which coats them with lampblack, to prevent sticking. In a test run a single machine cast 34,700 pounds of ingots in 58 minutes.

MINA LA LAPILLA.

SPAIN.

Mine office: Alosno, Huelva, Spain. Wm. Guthrie Bowie, manager. Is a group of government concessions, adjoining the Tharsis mine. Ores occur as a very wide lense, and range from 2.5% to 8% copper, and 47% to 50% sulphur. Was formerly operated by pillar-and-stall, leaving large quantities of ore in floors and pillars. Has about 1,200,000 tons of ore available underground, and much more if worked open-cast. Output is lessened because of poor ventilation. Property shows enormous quantities of scoria, left from smelting operations of the Romans. Is well equipped with machinery.

LA MANGIARDE, LTD.

FRANCE.

Offices: 5, Clements Inn, Strand, London, W. C., Eng. Letter returned unclaimed from alleged mine office, La Tour-sur-Tinée, Alpes Maritimes, France. T. Cowperthwaite, chairman. Organized October 30, 1903, with capitalization £4,000, shares £1 par; issued, £3,000. Lands, sundry coal mines and undeveloped mineral lands carrying indications of copper, in the neighborhood of Nice.

SUCESION C. J. LAMBERT.

CHILE.

Mine office: Brillador, La Serena, Coquimbo, Chile. Operates La Compañía mine, opened 1850, making 500 to 700 tons fine copper yearly. Also owns Las Bronces mine, 550' deep, opened 1940, and has an extensive smelting plant, employing circa 700 men, at last accounts.

ERZBERGWERK LAMPERTUS.

GERMANY.

Mine office: Hohenstein-Ernstthal, Saxony, Germany. Friederich Wilhelm Feltzner, president. Property carries auriferous and argentiferous arsenical ores of copper. Employed 12 men, at last accounts.

LA NATIVIDAD MINING CO.**MEXICO.**

Letters returned unclaimed from former office and mine office. Was a swindle. Described in Volume V. Succeeded by Mexican Mining Syndicate.

LANCASTER GOLD & COPPER MINING CO.

Office: care of David S. Johns, Keystone Hotel, Lancaster, Pa.

LANCELOT FREEHOLD TIN & COPPER MINES, LTD.**AUSTRALIA.**

Offices: 1, Bucklersbury, London, E. C., Eng. Mine office: Herberton, Queensland, Australia. F. E. Clotten, chairman and managing director; G. A. Waller, mine manager; F. J. Duck, secretary. Organized May 27, 1903, as a reorganization of the Lancelot Tin Mining Co., Ltd., with capitalization £120,000, shares £1 par; issued, £97,641. Debentures, £20,000 authorized, £19,250 issued, at 10%. Lands, 60 acres freehold and 160 acres leasehold, carrying ores of copper, tin, bismuth and wolfram, opened by a 327' main shaft and a 150' tunnel. Has a concentrating mill, and, at last accounts, was a small producer of tin and bismuth.

LANCONE MINE.**CORSICA.**

Owned by Consolidated Copper Co., Ltd.

COMPANIA MINERA LA PAZ.**MEXICO.**

Mine office: Cuatro Cienegas, Coahuila, Mexico. Has silver-copper ores.

LA PLATA CONSOLIDATED MINING CO.**UTAH.**

Letters returned unclaimed from former office, 310 Converse Bldg., Boston. Had lands near Ogden, Weber county, Utah. At last accounts officers were being sued by shareholders for an accounting.

LARDEAU-DUNCAN MINES, LTD.**BRITISH COLUMBIA.**

Office: 5 Wolverton Blk., Spokane, Wash. John MacKenzie, president; A. H. Wheatley, secretary and treasurer. Organized under laws of British Columbia, with capitalization \$150,000, shares 10 cents par. Lands, 3 claims, area 150 acres, with 4 adjoining claims under option, on Cariboo Creek, in the Lardeau-Duncan district of British Columbia, showing a quartz vein carrying gold, copper, silver and zinc, with a strong gossan capping carrying a little azurite. Development is by open-cut and a short tunnel, showing ores giving average assay values of \$19 per ton, mainly in gold and copper.

LA RITA DEVELOPMENT CO.**ARIZONA.**

Office: Tombstone, Ariz. Mine office: Fairbank, Cochise Co., Ariz. James Herron, president; Frank Hare and D. L. Cunningham, directors. Lands, 20 claims, near Mescal Springs, circa 16 miles west of Fairbank. Has 6 pits and trenches, showing silver bromides and copper carbonates, giving average assays of 12% copper and 100 oz. silver per ton.

LA ROCA-NEGRITA MINING CO.**MEXICO.**

Lands sold, circa 1903, to American-Mexico Mining & Development Co.

LAS ADARGAS MINING CO.**MEXICO.**

Office: 15 John St., New York. Mine office: Jiménez, Chihuahua, Mex. E. G. Seiler, president; Geo. E. Crawford, secretary; W. A. Seamon, general manager, El Paso, Texas. Claims to be organized under laws of New York, with capitalization \$1,000,000, shares \$10 par. Has a 300' shaft. Declared a dividend of 25 cents per share, April, 1902. Property said to be held un-

der a bond of \$300,000, on which \$15,000, has been paid. Regarded with much suspicion, and presumably idle.

LA SAL COPPER MINING CO.

COLORADO.

Succeeded, 1904, by Consolidated La Sal Mining & Smelting Co.

LAS ANIMAS COPPER MINING & SMELTING CO., LTD.

CHILE.

Offices: 2, Rumbold Place, Liverpool, England. Mine office: Chafaral, Atacama, Chile. Archibald Boxburgh, chairman; Pedro Nicolas Schjölberg, managing director in Chile; F. E. Owens, secretary; Guillermo Sheriff, mine manager. Organized Jan. 3, 1902, as successor of the Copper Corporation of Chili, Ltd., with capitalization £20,000, shares £1 par; issued, £15,000. Lands, 608,500 sq. yds., including the Fortunata mines, 430' deep, opened 1855, the Alena and Progreso mines, at Las Animas, in the Sierra Aspera district, and a smelting plant at Chafaral, which was blown in March 3, 1902. Production, 1903, was 27,384 metric tons of ore, yielding 2,671 metric tons matte of 61% copper tenor, equal to 3,701,976 lbs. fine copper, giving a return of nearly 6% from ores smelted.

LAS ANIMAS GOLD-COPPER MINING CO.

NEW MEXICO.

Office: 36-50 State St., Boston, Mass. Mine office: Hillsboro, Sierra Co., N. M. Jas. P. Mallette, president and general manager; Wm. T. D. Teefry, secretary and treasurer; W. W. Williams, superintendent; L. W. Getchell, consulting engineer. Organized 1900, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, in the Hillsboro district, 22 miles from nearest railway, showing a fissure vein averaging 8' width, with length of 3,500', giving assays up to 10% copper, 15 oz. silver and 2 oz. gold per ton, from oxide and sulphide ores. Has a shafts of 150' and 400', and 3 tunnels, with 4,000' of underground openings, estimated by company to give 100,000 tons of ore in sight and 60,000 tons blocked out for stoping. Has steam and gasoline power, with hoist good for depth of 1,000'. Idle at last accounts.

LAS ANIMAS MINING & SMELTING CO.

MEXICO.

Mine office: Altar, Sonora, Mex. Lands include Las Animas, El Purgatorio and other mines, carrying copper ores. Has steam power. Idle.

LAS COCHES MINING CO.

MEXICO.

Office: 1085 West 21st St., Chicago, Ills. Mine office: Ures, Sonora, Mex.

LAS GORITAS MINING CO.

MEXICO.

Office: San Francisco, Cal. Mine office: La Dura, Sonora, Mexico.

LASKAWANDA GOLD & COPPER CO.

Office: 40 State St., Boston, Mass.

MINAS LAS LEONORA y HUERTA.

MEXICO.

Office: Apartado 16, Aguascalientes, Mex. Mine office: Villanueva, Zacatecas, Mex. *G. M. Daniel, general manager; J. M. Daniel, Jr., superintendent and engineer; Manuel Varila, mine superintendent. Lands, 100 acres, also 500 acres miscellaneous lands, in the Jalpa district, showing a fissure vein in porphyry, of 10' average width, carrying argentiferous galena, argentite, malachite and azurite, with clay gouge, giving average returns of about 5% copper, 10% lead, 200 oz. silver and 29 milligrams gold per ton.

Has shafts of 300' and 1,000', with about one mile of underground workings. Was opened by the Spaniards, circa 1820, and reopened 1883. Has steam power and concentrator with 1 crusher and 12 planillas, for treating low-grade ores. Concentrates and smelting ores are shipped 75 miles, by burros, to the plant of the American Smelting & Refining Co., at Aguascalientes. Employed about 150 men, at last accounts.

LAS MORAS COPPER CO.

MEXICO.

Office: care of L. H. Taylor, Jr., Philadelphia, Pa. Mine office: Ameca, Jalisco, Mex. Geo. E. McCormick, president and general manager. Lands, 149 pertenencias, circa 6 miles southwest of Ameca, on the Hacienda San Miguel. Vein matter is of enormous width, walls not having been encountered in a 500' crosscut. Development is by circa 3,000' of tunnels, drifts and crosscuts, estimated to show 100,000 tons of medium grade argentiferous copper ore.

LA SOLEDAD MINING CO.

MEXICO.

Mine office: Ameca, Jalisco, Mex. C. D. O'Brien, manager. Has copper ores, developed by tunnel.

LAS PLAYAS-SINALOA MINING CO.

MEXICO.

Office: care of Geo. B. Clark, Commonwealth Trust Bldg., St. Louis, Mo. Apparently is a subsidiary corporation of the Sinaloa Exploration Co.

LAST CHANCE COPPER MINING CO.

WASHINGTON.

Mine office: Keller, Ferry Co., Wash. Idle.

LAST CHANCE MINE.

UTAH.

Absorbed, 1904, by Nevada-Utah Mines & Smelters Corporation.

LAST CHANCE MINING CO.

ARIZONA.

Succeeded, 1902, by Canyon Copper Co.

LAS TUSAS MINING & MILLING CO.

NEW MEXICO.

Mine office: Tres Piedras, Rio Arriba Co., N. M. Lon. L. Trout, general manager. Has auriferous copper ore, and a steam power plant.

LAS VEGAS COPPER CO.

NEW MEXICO.

Office: East Las Vegas, N. M. F. A. Manzanares, president; J. M. Thompson, secretary; J. M. Allen, treasurer and general manager; Frank J. Buck, consulting engineer. Capitalization \$100,000, shares \$1 par. Property is the Tecolote mine, in San Miguel county, New Mexico, showing auriferous and argentiferous copper ore, also a vein of bluestone or natural copper sulphate. Has steam and electric power, and a concentrator. Company claims to have developed about 5,000,000 tons of carbonate ore, which is too much.

LAS VIGAS MINING CO.

MEXICO.

Office: care of Geo. E. Voorhees, Jr., Santa Barbara, Cal. Mine office: Las Vigas, Coyame, Chihuahua, Mex. Carlos P. Halter, general manager. Lands, 74 pertenencias, area 173 acres, said to show 19 ore bodies, as fissures in sandstone and as contacts between sandstone and what probably is clay-slate, ores occurring as impregnations and replacements in the sandstone. Four of these bodies are being developed, these averaging 7' to 12' width and being claimed to give average returns of 7.5% copper and 3 oz. silver per ton, mainly from bornite and chalcopyrite, with occasional oxides, carbonates

and native copper. Has shafts of 61', 98', 125' and 179', with 3 short tunnels, estimated to develop 60,000 tons of ore. Property formerly was worked by the Spaniards. Has steam power, hoists and air-compressor. Buildings include an office, store and 19 dwellings. Ore is hauled by a Buffalo-Pitts traction engine to Las Trancas station, 43 miles distant, on the Kansas City, Mexico & Orient railroad. Production, 1903, was circa 300,000 lbs. fine copper.

LAS YAQUIS MINING CO.**MEXICO.**

Letter returned unclaimed from former office, San Francisco, Cal. Mine office: El Tiro, Sonora, Mex.

LATHAM MINING & SMELTING CO.**NEVADA.**

Succeeded, circa 1905, by Ohio Lead Mining & Smelting Co.

LATIMER COPPER MINING CO.**GEORGIA.**

Mine office: Pierceville, Fannin Co., Ga. Idle for some years.

LA TOUCHE-IRON MOUNTAIN MINES.**ALASKA.**

Owned by Reynolds-Alaska Development Co.

LATOUCHE ISLAND COPPER MINING CO.**ALASKA.**

Office: 49 Sullivan Bldg., Seattle, Wash. Jas. A. Murphy, president; Solon T. Williams, secretary; R. L. P. Wallace, treasurer. Organized under laws of Washington, with capitalization \$5,000,000, shares \$5 par. Control is said to have passed, late in 1905, to a New York and London syndicate, under the management of Col. J. Sutherland, which syndicate is said to have raised \$100,000 to develop the mine to the point of production. Lands, 29 claims and a millsite, carrying 4 miles of water frontage, on the eastern side of Latouche Island, Prince William Sound, Alaska, circa 60 miles south of Valdez. Lands are well timbered, and show 3 substantially parallel veins of 8' to 20' width, which carry 3.5% to 17% copper, opened by 2 short tunnels. Management is said to plan sinking a 250' shaft. Company refuses to give any information in response to requests, though offering stock to the public, a policy that is utterly opposed to all sound business principles.

LATOUCHE MINING CO.**ALASKA.**

Office: 10 Wall St., New York. Mine office: Latouche, Latouche Island, Alaska. Employs 12 to 30 men, according to season. Andrew K. Beatson, general manager, in whose name all operations are conducted. Organized 1902, under laws of New Jersey, with capitalization \$100,000. Is conducted as a close corporation.

Lands, 17 claims, patented, area 340 acres, on the western side and circa 3 miles from northern end of Latouche Island. Property has a good natural harbor, on tidewater. Country rock is slate, showing a vein that has produced chalcoppyrite returning 30% copper and 2 oz. silver per ton, and which averages about 10% copper, 2 oz. silver and 20 cents gold per ton. Development is by tunnels, No. 1 being 320' and No. 2, 650', with 5 upraises to surface, of 33' to 43' height, with a total of 1,400' of underground openings. Tunnel No. 2 will drain the mine, and also allow ore extraction from the entire property. All upraises are fitted with ore-bins having steel gates, and ore is milled down through same, giving cheap mining costs. Without power equipment, the

property, early in 1906, was extracting ore, and loading same on vessels, at a cost of only \$2.25 per ton. Mine has a half mile tram-line of 24" gauge, laid with 12-lb. rails, and is building another half-mile tram-line of 24" gauge, laid with 30-lb. rails. Property has a 300' wharf, on a natural harbor, near the mine. Freight rate to Tacoma, by water, is \$2.75 per ton, and ore being desirable for flux, is smelted at an average cost of only \$1.65 per ton. Company has a general merchandise store. To end of 1905 the mine shipped circa 3,000 tons of ore, averaging better than 10% copper, to smelters at Lady-smith and Tacoma. The property is one of unusual promise, and is being managed in a thoroughly business-like and satisfactory manner.

LA UNION CONSOLIDATED COPPER CO.

MEXICO.

Office: care of C. B. Bell, superintendent, Douglas, Ariz. F. J. Pierson, president; John S. Gessell, secretary and treasurer. Lands, 240 pertenencias, including the Reina de Cobre group, circa 35 miles east of La Cananea, and 20 miles west of Fronteras, in the Ajo Mountains. Development is by a 100' shaft, showing a 30" vein giving an average sampling of 15% copper, 30 oz. silver and \$12 gold per ton. Shipments of 230 tons, taken from a depth of 40' or less, returned 6% copper, 3.5 oz. silver and \$7 gold per ton. Property is considered promising.

LA UNION COPPER MINING CO.

ARGENTINA.

Mine office: Humahuaca, Jujui, Argentina. Has steam power and a small smelter, employing about 100 men, at last accounts.

LAURA-PEARL MINING & MILLING CO.

COLORADO.

Mine office: Newett, Chaffee Co., Colo. F. H. Denman, superintendent. Ores carry gold, silver and copper. Has steam power. Presumably idle.

LARIUM MINING CO.

MICHIGAN.

Office: 301-199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; Wm. J. Uren, general superintendent. Organized under laws of Michigan, with capitalization \$1,000,000, share: \$25 par. Annual meeting, second Tuesday in June. Lands originally were 640 acres, lying next east of the Calumet & Hecla, but a triangular tract of about 65 acres, carrying both surface and mineral rights, was sold, many years ago, to the Calumet & Hecla Mining Co., and circa 250 acres of surface rights have been disposed of since, as building lots, in the village of Larium, mineral rights being reserved, giving the company present holdings of approximately 325 acres of surface rights, with mineral rights to 575 acres. Property was prospected to some extent, 1904, by diamond drill borings.

LACLEDE CONSOLIDATED GOLD & COPPER MINING CO.

OREGON.

Office: 518 Broadway, Albany, N. Y. Mine office: North Powder, Union Co., Ore. H. Earle Furman, president; Geo. Oliver, vice-president; W. J. Curtis, secretary; D. Keefer, treasurer; W. N. Gardner, mine manager. Organized June 10, 1900, under laws of Oregon, with capitalization \$1,500,000, shares \$1 par. Lands, 160 acres, well timbered, 3 miles from a railroad, in the foothills of the Blue Mountains. Development is by several hundred feet

of shafts, tunnels and crosscuts, showing sundry parallel veins of 10" to 4' width, carrying ores assaying up to 10% copper, with good gold and silver values, and having an iron gangue. Company plans selling its product to the Oregon Smelting & Refining Co., at Sumpter, but was idle at end of 1905, presumably from lack of funds.

LEAD KING MINE.**COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. T. P. Lamoy, operator, under lease. Ores produced have given average smelter returns of 9% copper, 25% zinc, 8% lead and 20 oz. silver per ton.

LEEDS COPPER CO., LTD.**QUEBEC.**

Letter returned unclaimed from former offices, 11, Bloomfield St., London, E. C., Eng. Mine office: Broughton Station, Beauce Co., Quebec.

LEIGHTON-GENTRY COPPER CO.**WYOMING.**

Succeeded, 1904, by Independence Mining Co.

LEMON MINE.**ARIZONA.**

Mine office: St. Johns, Apache Co., Ariz. Has a 120' shaft, said to show ore carrying 10% copper, with small gold values.

LENA MINING CO.**NEW MEXICO.**

Letter returned unclaimed from former mine office, Lordsburg, N. M. **LENORA MINING & MILLING CO.**

UTAH.

Office: care of P. C. Evans, secretary, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Milford, Beaver Co., Utah. Miles L. Burns, president; J. D. Carpenter, general manager. Organized Dec. 19, 1903. Lands, 9 claims, known as the Lenora group, in Beaver county, Utah. Idle.

LENORA-MOUNT SICKER COPPER MINING CO., LTD.**BRITISH COLUMBIA.**

Office: Victoria, B. C. Mine office: Duncans, Vancouver Island, B. C. W. Buxton, superintendent, at last accounts. Lands, sundry claims, adjoining the Tyee, on Mt. Sicker, showing a continuation of lenses in a chute of 30' to 40' width, with strong gossan capping. Ore produced was divided into two grades, first grade averaging 7.95% copper, 3.57 oz. silver, and 0.17 oz. gold per ton, while the second grade, which was about two-thirds of the total production, averaged 2.3% copper, 1 oz. silver and 0.05 oz. gold. Ore was sent to the Crofton smelter, over a narrow-gauge railway. Management was extravagant, and company is in liquidation, but property is considered promising.

LENOX COPPER MINING CO.

Letter returned unclaimed from former office, 412 Tremont Bldg., Boston, Mass.

LENTZ GOLD-COPPER MINING & REDUCTION CO.**MONTANA.**

Office: 964 Penn Ave., Pittsburg, Pa. Mine office: Sheridan, Madison Co., Mont. Employs 6 to 12 men. C. E. Lentz, president and general manager; F. J. Mangus, vice-president; R. P. McChesney, secretary and treasurer; S. E. Brinnen, superintendent. Organized under laws of Arizona, with capitalization \$3,000,000, shares \$2 par. Annual meeting, third Friday in Feb-

ruary. Lands, 11 claims, area 220 acres, also a 20-acre millsite, in the Tidal Wave district, 7 miles from Northern Pacific railway, showing country rocks of porphyry, gneiss, granite and quartzite, carrying 10 veins, occurring as fissures in porphyry and as contacts between limestone, gneiss and granite, of which 3 are being developed, these being reported to have average widths of 16' to 30', with strong iron cappings, carrying average values of 2% copper, 12% to 50% lead, 12 oz. to 1,400 oz. silver, and \$8 to \$600 gold per ton. Ores are reported as of all varieties, but presumably are mainly oxidized ores. Development is by shafts of 30', 130', 60' and 110', and by tunnels of 80' 100', 120' and 1,600' with a total of 4,800' of underground openings, estimated to show 8,000 tons of high-grade ore and 160,000 tons of low-grade ore. Has two 60-h. p. hoists, good for 600' each, also a 1-drill air-compressor and 8 small mine buildings. Company plans continuous development during 1906. The Northern Star mine is in litigation. Property is regarded as promising.

LEONARD MINE.**MONTANA.**

Owned by Boston & Montana Copper & Silver Mining Co.

LERIDA COPPER MINES, LTD.**SPAIN.**

Voluntarily liquidated, September, 1902.

SOCIEDAD ANONIMA MINERA BELGA DE LOS COBRES DE LERIDA y GRANADA.**SPAIN.**

Voluntarily liquidated, September, 1902.

CAMPAGNIE CUIVRES DE LÉRIDE-GRÉNADE.**SPAIN.**

Voluntarily liquidated, September, 1902.

LE ROI MINING CO., LTD.**BRITISH COLUMBIA.**

Offices: 541, Salisbury House, London, E. C., Eng. Mine office: Rossland, Yale district, B. C. Employs circa 400 men. Anthony J. McMillan, managing director and general manager; H. A. Wesson, secretary; A. J. Trevor-row, mine superintendent; A. I. Goodell, smelter superintendent; W. S. Rugh, chief mine accountant. Organized June 7, 1898, with capitalization £1,000,000, shares £5 par. Paid a dividend of 1s., 6d., March 3, 1906, being the first since November, 1899.

Lands, 71.45 acres in fee, and the I. X. L. mine, held under lease. Also owns a good quarry of limestone for flux. Ore body is narrow at top and wide at bottom, but values decrease at depth. Main shaft has 4 compartments and is 1,450' deep, mine showing reserves, estimated by company at only 39,000 tons of ore, of gross average value of \$10.68 per ton. Diamond drill holes, bored from the bottom of the shaft, prove a continuance of the vein to greater depth. Bottom of mine shows 3' to 5' of good smelting ore. Property has a good mining equipment, including hoists, air-compressors, power drills, and steam-shovel, with necessary shops and mine structures.

The reduction works, at Northport, Washington, 17 miles from the mine, held in the name of the Northport Smelting & Refining Co., Ltd., are a complete and modern plant, of 1,200 ton daily capacity. Limestone for flux is secured from the company's quarry, only 4 miles distant, and water is supplied from Deep Creek, through a 3-mile flume, 4x5' in size, leading to two 125,000-gallon storage tanks, whence water is brought in pipes, under a head of 145', actu-

ating 18" and 24" Pelton water-wheels, under an effective pressure of about 60 lbs. per square inch.

The bulk of the ores treated are roasted before charging. Ore is received by rail and dumped into ore-bins of 1,600 tons capacity, elevated 17' above the roast-yard, which is 500x500', most of the ore being roasted before smelting. Ore is trammed to the roast-yard on temporary trestles, and roast-heaps are built about 125x350', and approximately 15' high, each roast-heap containing about 24,000 tons and requiring 6 weeks for burning. The roasting reduces the sulphur content from 10% to about 3.5%, and wood consumption averages 1 cord per 50 tons of ore. After burned the ore is loaded into self-dumping cars by a steam-shovel, capable of handling 600 tons of ore daily, and cars are hauled up an incline track by a small steam locomotive and dumped into the roasted ore bunkers, immediately behind the blast-furnace building.

The reduction plant includes a 70x98' sampling mill, with Vezin samplers. The calcining furnace building, 72x350', has two 35-ton 10x100' single-deck Holthoff-Wethey furnaces, and one double-deck furnace of the same design and dimensions, latter treating matte and concentrates. The blast-furnace building is 69x240', with a southern annex of 55x69', for the silica-mill, and a northern annex 69x100' for the power plant. There are 6 water-jacket blast-furnaces, with mechanical feed, two being 38x120' in size, one 40x160' and three 42x160', latter with daily capacity of circa 350 tons each. The furnace charges are mixtures of raw and roasted ore, with limestone and coke, charged from side-dumping cars. Steel downtakes of 60" diameter connect the blast-furnaces with the dust-chamber, which is 10x11x428', with hopper-bottom and side-discharge gates, leading to a brick smokestack 10' square and 182' high. There are also two smaller stacks. Flue-dust is briquetted, with lime for a binder, in two White mineral presses, and resmelted slags are granulated, and washed into the Columbia river.

The power plant at the smelter includes a 400-h. p. Allis-Chalmers engine, two smaller engines, 6 Connorsville blowers, a 500-light Westinghouse dynamo and five 250-h. p. Heine boilers. The first-fusion product is a 25% matte, which is roasted, granulated, briquetted and blown up to 50% matte, carrying considerable gold values and small silver values, which is shipped to New York for conversion and refining. In addition to treating Le Roi ores, the Northport smelter does a general custom business.

For the fiscal year ending June 30, 1904, production was 160,109 dry tons of first-grade ore, of the gross value of \$1,752,024, equal to \$10.94 per ton, and 19,013 tons of second-grade ore, worth \$143,078, equal to \$7.52 per ton. Production of fine copper, for fiscal year 1902, was circa 4,750,000 lbs. Operations showed a net loss of £88,195 in the fiscal year 1904, and a net profit of £49,741 in 1905. There has been a bitter fight among Le Roi shareholders, for two years past, this culminating in the summary removal of Mr. McMillan from the directorate, by his associate directors. This action was repudiated by the shareholders, at the annual meeting in 1906, and Mr. McMillan was again placed in power and signalized his victory by declaring a dividend. Efforts to consolidate the Le Roi with the Centre Star and

War Eagle were blocked by Mr. McMillan, who is as redoubtable a warrior as any of the paladins of old. The entire fight began over a disagreement between the Canadian Pacific and Great Northern railways over ore tonnage, the former desiring the abandonment of smelting at Northport, which is in the United States. After Mr. McMillan's ouster, the Northport smelter was closed and a three-year smelting contract made with the Trail smelter, but this is not recognized by Mr. McMillan. The property is making a little money, and Mr. McMillan apparently will be able to earn small but welcome profits, for the shareholders.

LE ROI NO. 2, LTD.

BRITISH COLUMBIA.

Offices: Salisbury House, London, E. C., Eng. Mine office: Rossland, Yale district, B. C. Employs circa 200 men. Lord Ernest Hamilton, chairman, F. A. Labouchere, secretary; Alex. Hill & Stewart, consulting engineers; P. S. Couldrey, mine manager; R. R. Cormack, assistant manager. Organized June 1, 1900, with capitalization £600,000, shares £5 par.

Lands, 72 acres, including the Josie and No. 1 mines, in addition to which the company added, during 1905, 8 claims, near the old mine, 2 claims in the Rossland district adjacent to the Velvet mine, and 5 claims in the Ymir district. The mine is about 600' deep, the Josie showing a new and important ore body on the 500' level, with indications of even better values on the 600', or bottom level. Ores carry values in gold, copper, and silver, in the order named, and are graded into two classes, for smelting and concentrating. Ore reserves have been estimated at 300,000 tons, which seems rather high. During 1904 and 1905, the company drilled 6,738' of diamond drill holes, at a cost of \$2.70 per foot in 1905.

Late in 1903 an Elmore oil concentrator, fully described in Vol. IV, was installed. This proved a technical but not a commercial success, and was superseded by Wilfley tables. The reasons for this outcome were several in number, among them being an advance in the price of oil, the extremely low grade of the tailings handled, and last, but probably most important, the small supply of material, which averaged only about 20 tons daily for a 50-ton plant, placing this interesting new process at a great disadvantage in tonnage costs. It is to be hoped the Elmore oil process may be given a fairer and more exhaustive test on low-grade tailings, where its technical advantages may be supplemented by fairer conditions.

Ores, formerly sent to the Greenwood smelter, are now treated at the Trail works, a 3-year contract for reduction having been made in 1905. Production, 1905, was 12,237 tons of smelting ore and 10,678 tons of concentrating ore, mined at a cost of \$4.22 per ton, and costing \$8.70 per ton for freight and smelting. The smelting ore gave average returns of 3.62% copper, 2.32 oz. silver, and 1.184 oz. gold per ton, with total gross values of \$35.78 per ton, an increase in gross values, Production of metals, for fiscal year 1905, was 885,992 lbs. fine copper, 28,365 oz. silver and 14,493 oz. gold. Largest copper production was 3,001,027 lbs., in the fiscal year 1902.

LE ROY MINING CO.

MEXICO.

Office: Pílares de Teras, Sonora, Mex. Lee Benton, manager. Ores carry silver, gold and copper. Presumably idle.

LESLIE COPPER MINING CO.

IDAHO.

Mine office: Mullan, Shoshone Co., Idaho. Lands, sundry claims, east of Mullan, opened by 2 tunnels, lower showing a strong vein of silver-lead ore, of milling grade, and a narrow copper paystreak. Was developing at close of 1905.

L'ETETE GOLD & COPPER

NEW BRUNSWICK & NOVA SCOTIA.

MINING CO.

Mine office: L'Etete, Charlotte Co., New Brunswick. Property is the old Johnston mine, opened circa 1860, reopened 1902, having two short tunnels and a 145' main shaft, showing ore of good assay value. Has a steam plant, and shipping facilities at tidewater. Company also owns mineral lands in Nova Scotia. Presumably idle.

LEVANT MINING CO., LTD.

ENGLAND.

Offices and mines: St. Just, Cornwall, England. T. R. Bolitho, chairman; Maj. R. White, secretary. Organized 1872, as a cost-book company, with 2,500 shares, 2,385 issued, £12 4s. 6d. paid in. Dividends, £25 6s. per share, last, 5 shillings, paid January, 1904. Mine produces tin and copper, mainly the former, and has been continuously worked since 1820, paying £170,000 in dividends, during its first 20 years of operation. Is now a small producer only.

LEVIATHAN MINE.

CALIFORNIA.

An idle mine, 10 miles east of Markleeville, Alpine county, California. Ore occurs as lenses, in porphyry. Mine is opened by tunnels of 400' and 700'.

LEWISOHN EXPLORATION & MINING CO.

Office: 11 Broadway, New York. J. Parke Channing, general manager; Martin H. Vogel, counsel. Organized January 5, 1906, under laws of New Jersey, with capitalization \$5,000, which it is planned to increase to \$50,000,000, by easy stages, as properties are acquired. Plan of promotion and finance is somewhat similar to that of the American Smelters Securities Co. It is supposed that this company will become a securities-holding corporation for the various Lewisohn interests, which include the Tennessee Copper Co. and General Development Co., with a considerable share interest in the Nevada Consolidated Copper Co.

LEXINGTON MINE.

MONTANA.

Owned by La France Copper Co.

LIBERTY COPPER MINING & MELTING CO.

MARYLAND.

Dead. Property sold to Virginia Consolidated Copper Co.

LIBERTY GOLD & COPPER CO.

Office: Prescott, Ariz. Frank Burns, manager. Property is on the line of the Arizona & California Railroad, in vicinity of Bill Williams Fork river, a tributary of the Colorado river, and presumably is in Yuma county, Arizona, though possibly in San Bernardino county, California. Is slightly developed, but is said to give a promising showing.

LIBERTY MINING & SMELTING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz. Ores carry silver, lead and copper. Has gasoline power.

SOCIETA ANOMINA PER L'ESERCIZIO DELLA**ITALY.****MINIERE DE LIBIOLA.**

Mine is leased to Libiola Copper Mining Co., Ltd.

LIBIOLA COPPER MINING CO., LTD.**ITALY.**

Offices: 138, Leadenhall St., London, E. C., Eng. Mine office: Sestri Levante, Liguria, Italy. Kenneth Haweis James, chairman; preceding officer, T. V. Anthony and A. Strove, directors; W. S. Bartlett, secretary; Robert H. Craven, mine manager. Organized 1888, under laws of Great Britain, (as reconstruction of a company of same name, organized January, 1867,) with capitalization £250,000, shares £5 par. Paid dividends of 2s. 6d. in 1903; 3s. 6d. in 1904, and 3s. 6d. in 1905, with total dividends, to end of 1905, of £4 10s. Annual meeting, April 30. Company has a heavy share interest in the Crucen silver-lead mine, Sardinia, now idle. Lands, 2 claims, area circa 700 hectares, freehold, including the Libiola copper mines, in Liguria, northern Italy. Ores are chalcopryite and iron pyrites, occurring as veins in serpentine and diabase, ore bodies being of good size. The property was discovered and worked by the Romans and was reopened, 1867, by predecessor of present company. Ores produced average 5.76% copper in the cupriferous ore and 46.75% sulphur in the pyrites. Mine is estimated to have 91,880 long tons of ore in sight, with 80,000 tons blocked out for stoping, this including both copper and iron pyrites. Equipment includes a 60-h. p. steam plant, 30-h. p. water plant and 50-h. p. electric plant.

The crushing mill, covering 550 square meters, built of reinforced concrete and stone, has a daily capacity of 180 tons. Production, 1905, was 28,388 tons of copper and iron pyrites, of which about 20% was copper ore. Company has a good management, and, by careful handling, the property is made to return very satisfactory profits.

SOCIÉTÉ DES MINES DE LA LIENNE.**ITALY.**

Mine offices: Alagna and Riva, Circondario di Varallo, Novarra, Italy. Ore is medium grade chalcopryite. Mines are worked on a limited scale.

SOCIETA LIGURE RAMIFERA.**ITALY.**

Mine office: Casarza, Ligure, Italy. Mines include the Fontanelle, Rio Albareta, Rio Monticello and Rio dei Fichi. Ore is chalcopryite, in quartzose gangue. Is a regular producer, on a small scale.

LILYAMA MINE.**CALIFORNIA.**

Office: care of Robt. Crocker & Co., Placerville, Cal. Mine office: Auburn, El Dorado Co., Cal. Lands, 240 acres, unpatented, 11 miles from Auburn. Ores, mainly sulphides, occur as lenses in limestone, lying between granite and quartz-porphyry. Has 4 tunnels and a prospecting shaft. Idle.

LILLY MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Ores carry gold, silver, lead and copper. Has steam power.

LIMA COPPER MINING SYNDICATE, LTD.

Voluntarily wound up, February, 1903.

LIME CREEK CONSOLIDATED GOLD & COPPER CO.

ARIZONA.

Dead. Property sold to Kentucky-Arizona Consolidated Mining, Smelting & Development Co.

LINARES MINING SYNDICATE, LTD.

SPAIN.

Mine office: Linares, Jaen, Spain. S. Moos, manager. Organized, 1903, to exploit lead, copper, zinc, iron and coal properties in the vicinity of Linares. Planned constructing a large warehouse and shipping pier, at Almeria, Spain. Presumably idle.

LINCOLN CONSOLIDATED COPPER CO.

NEW MEXICO.

Office: care of Daniel D. Hunt, St. Joseph, Mo. Mine office: Jarilla, Otero Co., N. M. Organized April 13, 1906, under laws of New Mexico, with capitalization \$50,000. Lands, said to be 2 claims, held under bond and lease from the Southwest Smelting & Refining Co. Mine shows a 5' vein, opened by a shallow 2-compartment shaft, from which a carload shipment of ore, taken from a depth of less than 15', gave returns of 11.1% copper and 3 oz. silver per ton.

LINCOLN CONSOLIDATED MINING CO.

ARIZONA.

Office: 1563 Sherman Ave., Evanston, Ills. Mine office: Tucson, Pima Co., Ariz. Employs 30 men. Chas. A. Wightman, president; Fred W. Tickett vice-president and general manager; Geo. E. Fernald, secretary and treasurer; H. B. Sturtevant, superintendent. Organized June, 1904, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par; issued, \$1,200,000. Annual meeting first Monday in June.

Lands, 35 claims, area 700 acres, including the Garcia group of 31 claims, also a 100-acre millsite, with total holdings of circa 1,000 acres, in the Papago district, showing country rocks of limestone, granite-porphry and diorite, carrying various ore bodies, of which 5 are slightly developed, these ranging 4' to 25' in width, and being opened by 6 shafts, of 50' to 120' depth, of which 3 are being deepened, and by a 150' tunnel. Smeltershipments from Providence claim are said to have given average returns of circa 30% copper, with fair gold and silver values, and property is said to have produced about \$80,000 worth of ore. Equipment includes two 15-h. p. gasoline hoists, good for 400' depth, and a 15-drill Rand air-compressor. There are 5 buildings, including an 18x20' machine shop, 14x60' smithy, store and several dwellings. Property is 12 miles from the Twin Buttes railroad, which is said to plan building a branch line thereto.

LINCOLN COPPER CO.

ARIZONA.

Succeeded, circa 1904, by Lincoln Consolidated Mining Co.

LINCOLN COPPER DEVELOPMENT CO.

Office: 326 Post St., San Francisco, Cal. Location of property, if any, not learned. Company is regarded with suspicion, owing to the address given having been the hiving place of a swarm of more than doubtful mining propositions, put out by one "Baron" W. E. von Johannsen, a notorious grafter.

LINCOLN COPPER MINING CO.

ARIZONA.

Office: 321 Spruce St., Aurora, Ills. Capitalization \$3,000,000, shares \$1

par. Lands claimed were 42 claims, area circa 850 acres, in the Sierrita Mountains, now held by the Lincoln Consolidated Mining Co.

LINCOLN COPPER MINING CO.

MONTANA.

Office: care of Jas. A. Talbott, Butte, Montana. Incorporated July, 1903, under laws of Montana, with capitalization \$1,500,000, shares \$1 par. Among the incorporators given was Thos. H. Carter, but Senator Carter writes that his name was used without his knowledge or consent. Lands, said to be 10 claims, in the Little Boulder district, about 30 miles from Helena Lewis & Clark county, Montana.

LINCOLN MINE.

NEVADA.

Mine office: care of John F. Lincoln, manager, Goodsprings, Lincoln Co., Nev. Property shows ores assaying up to 15% copper, with gold and silver values.

LINCOLN MINE.

UTAH.

Mine office: Minersville, Beaver Co., Utah. Gus Stoney, superintendent, at last accounts. Ores carry silver, lead and copper. Is opened by shaft, and has steam power. Idle.

LINCOLN MINING & MILLING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Ores carry gold, silver, copper and lead. Has steam power and a 15-stamp mill.

MINA LINEA DIVISORIA.

CHILE.

Mine office: Chafaral, Atacama, Chile, Braniff y Roldan, owners. Employed about 25 men, at last accounts.

LINEDALE WEST CHILLAGOE, LTD.

AUSTRALIA.

Dead.

LION COPPER MINING CO.

ARIZONA.

Office: 313 West Second St., Los Angeles, Cal. Mine office: Stoddard, Yavapai Co., Ariz. Chas. Matthews, president; O. A. Cox, secretary and treasurer; Henry Reifsnnyder, general manager. Organized February, 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands, 13 claims, area 260 acres, in the Agua Fria district, 6 miles from the nearest railroad. Country rocks are limestone, quartzite and dioritic porphyry, showing numerous veins carrying oxide, carbonate and sulphide ores, giving average assays of 24% copper, opened by shafts of 50', 100' and 300', with 515' of underground workings. Has gasoline power, and is diamond drilling from bottom of the 300' shaft.

LION GOLD MINING & MILLING CO.

COLORADO.

Mine office: Silverton, San Juan Co., Colo. Chas. Newman, superintendent. Ores carry gold, silver and copper. Has steam power.

LITHGOW COPPER SMELTING & REFINING WORKS.

AUSTRALIA.

Owned by Great Cobar Copper Mining Syndicate.

LITTLE BAY MINE.

NEWFOUNDLAND.

Idle. Owned by Carmen Copper Mines, Ltd.

LITTLE BULLY HILL MINING & SMELTING CO.

CALIFORNIA.

Letter returned unclaimed from former office, San Francisco, Cal. Capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, said to adjoin the Bully

Hill mine, opened by a 130' tunnel and several trenches, said to show sulphide ore. Presumably dead.

LITTLE GIANT MINING, MILLING & SMELTING CO. WASHINGTON.

Letters returned unclaimed from former office, Spokane, Wash., and from former mine office, Marcus, Stevens Co., Wash.

LITTLE HELVETIA MINE. ARIZONA.

Owned by Tip Top Mining Co.

LITTLE MATTIE MINING, MILLING & POWER CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. F. V. S. Leebrick, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power and a 20-stamp mill.

LITTLE NORTH FORK MINING & MILLING CO. IDAHO.

Mine office: Wardner, Shoshone Co., Idaho. J. Kalbenbach, superintendent. Is developing by tunnels.

LIVE OAK COPPER MINING & SMELTING CO. ARIZONA.

Office: 438 Broome St., New York. Mine office: Globe, Gila Co., Ariz. Employs 300 men. Forest J. Kaldenberg, president; Forest J. Kaldenberg, Jr., vice-president; G. W. Augustin, secretary and treasurer; Jos. C. Erman, general manager; Edward P. Worthington, superintendent; Geo. F. Wilson, mine superintendent. Organized under laws of Arizona, with capitalization \$1,250,000, shares \$1 par.

Lands, 16 claims, area 320 acres, in the Globe district, showing country rocks of schists and quartz-porphyry, with lenticular ore bodies occurring in contact veins. Property shows 8 known veins, of which 3 are under development, these averaging 10' width by 700' proven length, and 300' estimated average depth, carrying chalcocite, chalcopyrite, chrysocolla and diopside, giving average returns of 10% copper. Mine has shafts of 85' and 250', and tunnels of 900', 125', 175', 185', 725' and 60', with a total of about one mile of underground workings, estimated to show 120,000 tons of ore, with 65,000 tons blocked out for stoping. Ore shipped is graded into first class, carrying circa 24% copper, and second-class, averaging 12% copper. Property was discovered 1888, opened 1897, closed the same year, through mismanagement, and reopened, September 1, 1905, by Mr. Erman.

Mine has a 200-h. p. hoist, good for 1,500', and an 8-drill Sullivan air-compressor, with 12 buildings, for various uses. The Gila Valley, Globe & Northern Railroad, 8 miles distant, will build a spur to the mine. Fuel is crude petroleum.

Production, 1905, was 587,961 fine lbs. copper, and 1906 output will be much larger. Ore is shipped to the Old Dominion smelter, at Globe, Copper Queen reduction works at Douglas, and the El Paso plant of the American Smelting & Refining Co. December production gave about \$30,000 net smelter returns, and the company has contracted to ship 1,500 tons of silicious sulphide ore monthly, to the El Paso smelter. Mr. Erman took charge of the property September 1, 1905, after 9 years of idleness, with the exception of a little gophering, done by 30-day leasers. The company furnished absolutely no capital, and Mr. Erman took out sufficient ore, in 6 months, to pay all operating

expenses, and to expend \$20,000 on mine equipment, ore-bins, machinery and roads, in addition to securing a large amount of development. There has been some hitch between the owners, with Mr. Kaldenberg on one side and Mr. Erman on the other, it appearing that Mr. Kaldenberg awoke suddenly to the fact that the property was very valuable, and desired to regain control immediately, at the expense of Mr. Erman and various leasers. Sympathy, in the Globe district, is overwhelmingly with Mr. Erman, and he is entitled to the greatest degree of credit for the altogether admirable manner in which he has rejuvenated and developed this property, which bids fair to develop ultimately into one of the big copper mines of Arizona.

LIVERMORE GOLD & COPPER MINING CO.

WYOMING.

Letters returned unclaimed from former office, Laramie, Wyo. Organized May, 1902, with capitalization \$1,000,000, to take over the Cumberland, Empire, Flying Dutchman, and Eureka claims, in the vicinity of Laramie.

MINAS LLANOS BLANCOS y LOS PATOS.

CHILE.

Mine office: Tamaya, Tongoya, Ovalle, Chile. Opened 1903. Main shaft is 250' deep. Idle.

"LLOYD" COPPER CO., LTD.

AUSTRALIA.

Offices: 195A, Winchester House, London, E. C., Eng. Mine office: Burraga, County Bathurst, New South Wales, Australia. Employs circa 350 men. Alexander Creighton Arthur, chairman; W. H. Corbould, general manager; H. A. McMahon, secretary. Organized May 9, 1899, with capitalization £250,000, shares £1 par; debentures, £50,000, first mortgage, at 10%, payable £10,000 annually, beginning July, 1906. Had a stock interest in the Murrin Copper Co., Ltd., which proved a failure.

Lands, 380 acres freehold and 385 acres leasehold, in the Bathurst district. Ore is slightly argentiferous chalcopyrite, with quartzite gangue, occurring in fissures traversing acid diorite. Mine, opened 1877, is extensively developed, main shaft, 2,300', being bottomed in badly disturbed ground. Ore is lower in grade at depth, and company is said to have decided to close down the old mine, early in 1906, except for a little scrambling. Other properties are being opened, with a view to replacing the production of the old mine. Operations are suspended occasionally, from lack of water, although the mine has an 85,000,000-gallon storage tank, holding water for about 9 months supply.

The reduction plant, built 1901, at a cost of £32,000, includes a concentrator and smelter. The latter had two blast furnaces, one of which was sold to the Murrin Copper Co., which was wound up at a heavy loss, so the furnace was practically lost. The other has been sold to the Great Cobar, and reverberatories are used exclusively. In 1905 the largest reverberatory furnace in New South Wales was built at this smelter, which also has a converter plant. Equipment includes an electric plant and necessary steam and winding machinery. Fuel is wood, of which 60,000 cords are burned yearly. Production has decreased for several years past, and for fiscal year 1905 was only 2,058,560 lbs. fine copper. Property enjoys a good management.

LLUVIA DE COBRE MINING CO.

MEXICO.

Office: 407 Fidelity Trust Bldg., Kansas City, Mo. Wm. E. Jones, mana-

ger. Lands include several copper and silver claims, in the Papago district, circa 50 miles south of Hermosillo, Sonora, Mexico.

LOCH WINNOCH MINE.**SCOTLAND.**

An old and long idle property, about 9 miles from Glasgow, at Loch Winnoch, Renfrewshire, Scotland.

LOG CABIN GOLD & COPPER CO., LTD.**UTAH.**

Office: 606 D. S. Morgan Bldg., Buffalo, N. Y. Mine office: Marysville, Piute Co., Utah. P. S. Merrill, president; H. M. Tyler, vice-president; J. I. Stanton, secretary; M. H. Fralic, treasurer; preceding officers, A. J. Hathaway, L. L. Flower and G. R. Watson, directors; M. F. Murray, general manager; Ole Larsen, superintendent. Organized November 26, 1901, under laws of Ontario, with capitalization \$3,000,000, shares \$1 par. Lands, 67 claims, area 1,350 acres, in the Mount Baldy district, 12 miles west of Marysville, the terminus of the Rio Grande & Eastern railroad. Company formerly owned 700 acres on Wild Potato Lake, 12 miles east of Mine Centre, Rainy River district, Ontario, carrying a gold-bearing quartz vein, on which 2 shallow shafts were sunk, and 240 acres on Heron Bay, Lake Superior, Ontario, said to show indications of copper. Letter returned unclaimed from former office at Mine Centre, and company reports Utah holdings only, so Canadian lands doubtless were lost. Development of Utah lands is by a little more than 3,000' of workings, mainly in three tunnels, of which the Franklin tunnel only is driving at present. Property is said to show a wide vein, giving average assays of \$10 per ton. Machinery includes an air-compressor at the Franklin tunnel.

LOMAGUNDA DEVELOPMENT CO., LTD.**RHODESIA.**

Offices: Salisbury House, London, E. C., Eng. John Seear, chairman; H. Ewer Jones, consulting engineer; Geo. T. Frost, secretary; Rhodesia Exploration & Development Co., Ltd., agent in Rhodesia. Organized June 18, 1894, capitalization increased December, 1901, to £250,000, shares £1 par; issued, £227,850. Paid a 10% dividend, November, 1905. Lands, 407 claims, in the Lomagunda district of Mashonaland, including the United Kingdom claim, on which development, now under way, has shown a promising body of auriferous copper ore. Company also has extensive shareholdings in the Consolidated African Copper Trust, Ltd., Ayrshire Gold Mine & Lomagunda Railway Co., Ltd., and Rhodesian Banket Co., Ltd.

LOMA VERDE COPPER CO.**ARIZONA.**

Letters returned unclaimed from former office, 316 Bradbury Bldg., Los Angeles, Cal. A stock-jobbing scheme, which paid a small dividend, 1903, and then closed down. Fully described in Vol. V.

LOMBARD COPPER CO.**OREGON.**

Letter returned unclaimed from former office, Baker City, Ore. Organized July 19, 1902, by F. L. Evans, H. C. Pearson and W. G. Main, with capitalization \$2,000,000. Apparently dead.

LOMBARD GOLD & COPPER MINING CO.

Letters returned unclaimed from former office, Salt Lake City, Utah.

LONDON-COLORADO PROPERTIES, LTD.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Has a bond and lease on the

Pierce mine, near Central City, which gives a good showing of copper ore
LONE PINE MINING CO. **ARIZONA**

Absorbed by Pan American Mining & Smelting Co. Was a bad egg.

LONE STAR COPPER CO. **TEXAS**

Letters returned unclaimed from former mine office, Henrietta, Clay Co., Texas. Described in Vol. III.

LONE STAR MINE. **ARIZONA**

A property near Williams, Coconino county, Arizona, now known as the Central Arizona mine.

LONE STAR MINE. **ARIZONA**

A property near Solomonville, Graham county, Arizona, owned by Maravilla Copper Co.

LONG BEACH & ARIZONA MINING CO. **ARIZONA**

Office: care of Southwestern Securities Co., Los Angeles, Cal. Mine office: Jerome Yavapai Co., Ariz. T. H. Brown, president; A. E. Brown, vice-president; T. C. Jordan, secretary; C. E. Nathorst, general manager. Organized September, 1905, under laws of Arizona, with capitalization \$500,000, shares \$1 par. Lands, 7 claims, known as the Rawhide group, a short distance south of Jerome, opened by a 100' shaft.

LOOKOUT GROUP. **ALASKA**

Office: care of H. H. Wakefield, Ketchikan, Alaska. Lands, 6 claims, at Niblack Anchorage, Prince of Wales Island, Alaska, said to give a fair showing of medium-grade copper ore.

LORDSBURG MINING & REDUCTION CO. **NEW MEXICO**

Office: care of Thomas A. Lister, Lordsburg, Grant Co., N. M. Organized April, 1906, with capitalization \$600,000.

COMPANIA MINERA LORETA y PROVIDENCIA. **MEXICO**

Mine office: Candamena, Chihuahua, Mexico. Owned by Jesus Poyval, Rascon Bros. and E. R. Bones. Ores carry silver, copper and lead. Has a 500' main shaft and a 900' tunnel, with water power, 5-stamp mill and a one-ton smelter.

LORRAINE COPPER MINING CO. **WASHINGTON**

Office: Hoquiam, Wash. Mine office: Keller, Ferry Co., Wash. Owen Jones, president; A. G. Rockwell, secretary; Fred J. Chamberlain, general manager. Organized April 13, 1900, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Lands, 22 claims, area 422 acres; also a 20-acre millsite, in two groups, the Wilmot group being in the Sans Poil mining district of Ferry county, and the Lorraine group in the Carbon River district of Pierce county, Washington. Properties show 7 ore bodies, as fissures in granite on the Lorraine group, and as contact veins between porphyry and schist on the Wilmot group. Contact veins of the Wilmot group are 4' to 6' wide and give average assays of 6.5% copper, 40 oz. silver and \$4 gold per ton; fissure veins on the Lorraine group give assays of 20% copper, 5 oz. silver and \$10 gold per ton. The Wilmot group shows malachite and azurite near surface, with chalcocite, bornite, and chalcopyrite at depth. The Lorraine group shows bornite and chalcopyrite. Developments on

the Lorraine include 4 shafts, deepest 100', and 8 tunnels, 3 longest being 221' 472' and 630'. Properties have 2,016' of underground openings. Idle

LOS ALAMOS MINING & MILLING CO.**MEXICO.**

Office: care of Dr. Finis E. Yoakum, president, Los Angeles, Cal. Letter returned unclaimed from former mine office, Alamos, Sonora, Mex. Claimed to have an encouraging showing of auriferous copper ores. Not favorably regarded.

LOS CERROS COPPER CO.**CUBA.**

Office: Blackstone Bldg., Cleveland, Ohio. Mine office: Fomento, Santa Clara province, Cuba. Idle. S. S. Saffold, president; W. C. Watkins, vice-president; Sherman C. Dalbey, secretary; W. L. Rees, treasurer; Col. D. H. Pond, general manager. Organized August 12, 1905, under laws of Arizona, with capitalization \$500,000, shares \$100 par. Lands, 2 claims, area 100 acres, also 1,500 acres of miscellaneous lands, opened by shafts of 25', 35', and 50', and by tunnels of 80', 80', 200', 205' and 250', showing ore assaying 10% copper, 20% to 25% zinc, 20% sulphur and 30% silica, with gold and silver values. Zinc apparently is decreasing at depth. Vein has a 12' to 15' gossan outcrop along its strike. Property is an antigua, operated in the Eighteenth Century, and idle since circa A. D. 1750.

LOS MARCHES MINING CO.**MEXICO.**

Mine office: Indé, Durango, Mex. Was completing a new concentrator and smelter, early in 1906.

LOS MUERTOS MINING CO.**MEXICO.**

Mine office: Velardeña, Durango, Mex. Carter Barker, superintendent. Ores carry copper, silver and lead. Has steam power and employed about 100 men, at last accounts.

LOST GARNET GOLD & COPPER MINING & MILLING CO.

Letter returned unclaimed from former office, Everett, Wash.

LOST GULCH COPPER CO.

Letter returned unclaimed from former office, Los Angeles, Cal.

LOST PACKER EXTENSION MINING CO.**IDAHO.**

Office: care of Col. O. P. Chisholm, secretary and treasurer, Bozeman, Montana. W. W. Chisholm, president. Is claimed to have a smelter in operation at mines on Loon Creek, circa 90 miles from Murray, Idaho.

NUEVA SOCIEDAD COMPAÑIA DE LOTA i CORONEL.**CHILE.**

Office: Valparaiso, Chile. Mine office: Chafaral, Atacama, Chile. Santiago Collins, manager. Capitalization, \$18,000,000. Owns and operates mines in different parts of Chile. The Descubridora mine, at Carizalillo, Chafaral, was opened 1850 and is about 650' deep. The Lota mine, opened 1856, in the department of Lautaro, and the Maitenes, opened 1844, in the department of Santiago, are among the more important copper mines, and the company also owns sundry coal mines. The leading mines and the smelter, are equipped with steam and electric power, and the latter has a converter plant and refinery. Production averages circa 10,000,000 lbs. fine copper yearly, shipped to Europe as Chile bars and ingots.

LOTUS GROUP.**COLORADO.**

Mine office: Russel Gulch, Gilpin Co., Colo. L. Sternberger, superintendent. Ores carry gold, silver and copper. Has steam power.

MINA DO LOUZAL.**PORTUGAL.**

Office: 4, Praça dos Remolares, Lisbon, Portugal. Mine office: Louzal, Grandola, Alemtejo, Portugal. Is the property of a syndicate of 6 owners. Senhor Waldemar d'Orey, general manager; Joaquin Chaves, mining captain. Lands, 1 square kilometre, showing 6 known ore bodies, largest with maximum width of 25 metres, other dimensions unknown, giving returns of 0.5% to 13% copper and 1.2 oz. silver per ton, with traces of lead, zinc and gold, mainly from cupriferous iron pyrites, with occasional oxides and a little native copper. Has 4 shafts, of 12 to 30 metres depth, and a 300-metre tunnel, with about 1,000 m. of underground openings, estimated by owners to show about 3,000,000 tons of ore. Property was discovered and opened by the Romans, and was reopened by present owners in 1901.

LOW DIVIDE COPPER MINING CO.**CALIFORNIA.**

Office: care of John Murray, president, Crescent City, Cal. Lands are the Alta, Occidental and Copper Hill groups, in Del Norte county, California, on which several different veins have been opened slightly, these showing oxide, carbonate and sulphide ores of good grade. Presumably idle.

LOWER MAMMOTH MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. Sidney Bamberger, manager. Wm. Ball, superintendent. Has 150,000 shares. Main shaft, 1,200'. Has steam and electric power, and employs circa 125 men. Ores treated, 1902, averaged 3% copper, 52 oz. silver and 85 cents gold per ton.

LOYAL LEASE MINE.**BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C.. H. W. Treat, owner. Lands, circa 3 miles from Van Anda, show outcrops similar to those of the Marble Bay mine. Development is by a 200' shaft, showing bornite and chalcopryrite of good grade. Has steam power and plans making small ore shipments during 1906.

GUSTAVO LOZANO.**SAN SALVADOR, C. A.**

Mine office: Chalatelango, San Salvador, Central America. Produces copper, gold and silver, on a small scale. Has steam power, and employed about 100 men, at last accounts.

LUCERO COPPER MINING CO.**NEW MEXICO.**

Letters returned unclaimed from former mine office, Mora, Mora Co., N. M.

LUCKY DAY MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, Seattle, Wash. Lands, in the Silver Creek camp, Snohomish county, Washington, are said to show a 6' vein of copper ore, opened by a 300' tunnel.

LUCKY DUTCHMAN MINING & DEVELOPMENT CO.**NEVADA.**

Office: care of H. B. Cole, secretary-treasurer, Salt Lake City, Utah.

W. J. Snyder, president; John R. Royer, vice-president; preceding officers, B. O. Atkins, C. L. Anderson, and R. S. Weimer, directors. Organized 1905, with capitalization \$125,000, shares 25 cents par. Lands, 4 claims, in the Crescent district of Lincoln county, Nevada.

LUCKY GOLD & COPPER MINING CO.

ARIZONA.

Mine office: Kelvin, Pinal Co., Ariz. J. D. Ferree, president. Lands, sundry claims, in the Riverside district, undeveloped, but with good surface showings.

LUCKY STRIKE COPPER MINING CO.

WYOMING.

Office and mine: Rawlins, Carbon Co., Wyo. Organized 1904, to develop sundry claims 5 miles northwest of Rawlins. Presumably idle.

LUCKY VERDE COPPER CO.

ARIZONA.

Dead. Lost lands, 1904.

LUCY L. MINING & MILLING CO.

UTAH.

Frank L. Wilson, secretary and treasurer. Property, in the Deep Creek district of Juab county, Utah, is said to present a good surface showing of rich copper ore. Presumably idle.

LUDWIG COPPER MINING CO.

NEVADA.

Mine office: Yerington, Lyon Co., Nev. Has auriferous and argentiferous copper ores, including exceptionally handsome malachite and azurite, considerable quantities of which are sold to lapidaries. Mine water is claimed to carry 1.6% copper, and development is now below the water-level. Has steam power and a 30-ton smelter, but needs a railroad connection. Shipments were resumed, 1906, to the Tacoma smelter.

KUPFERBERGWERK LUDWIGSDORF.

GERMANY.

Mine office: Ludwigsdorf, Schlesien, Germany. Employed 40 men, at last accounts.

LUKE CREEK GOLD-COPPER MINING CO.

BRITISH COLUMBIA.

Office: 435 Temple Court, Minneapolis, Minn. Letter returned unclaimed from former mine office, Marysville, Fort Steele division, East Kootenai, B. C. S. D. Pumpelly, president and general manager; E. D. Barcalow, secretary. Capitalization \$1,000,000, shares \$1 par. Lands, 2 claims. Idle.

LUSTRE MINING CO.

MEXICO.

Reorganized, January, 1906, as Lustre Mining & Smelting Co.

LUSTRE MINING & SMELTING CO.

MEXICO.

Office: Pittsburg, Pa. Mine office: Indé, Durango, Mexico. H. D. Gamble, president; J. H. Mueller, vice-president; C. H. Tebbetts, secretary; W. H. Graham, treasurer. Organized January, 1906, under laws of Arizona, with capitalization \$5,000,000, as successor of Lustre Mining Co., organized under Iowa laws, with capitalization \$1,000,000. Old company ended 1905 with assets of \$233,409 and liabilities of \$766,926. Was in litigation, February, 1906, certain shareholders alleging irregularity in stock issue of old company, and asking a receiver.

Property is the Mina Magistral, which has a large body of auriferous, argentiferous and slightly cupriferous iron pyrites, carrying 0.5% to 5% copper, 1 oz. silver, and up to \$10 gold per ton. Ores are refractory, and ex-

periments with chlorination and cyaniding both failed, after years of work by the best talent, and with a very complete equipment. Plant includes two 90-h. p. engines, burning charcoal, and a 200-h. p. producer-gas plant is to be installed. Property has a 40-stamp mill, 2 Huntington mills, chlorination works and a cyanide plant, installed at a collective cost of \$500,000, but all idle, as none succeeded in saving more than 60% of the assay values.

Extensive experiments in pyritic smelting giving successful results, this system has been adopted exclusively, for the treatment of ore. The smelter has two 150-ton McDonald hot-blast furnaces, and the addition of a third of the same capacity is planned. Air for blast is heated by waste heat from furnaces by a specially designed McDonald hot-blast heater. Product is a matte containing principally gold values. West Virginia coke is used for fuel, to the extent of 400 tons monthly. The smelter is said to be saving 95% to 97% of the assay values, and custom smelting was begun, late in 1905.

This company and its predecessors have been operating for nearly 25 years, and, through poor management and trouble with refractory ores, accumulated an immense debt, which has been reduced, during the past two or three years, but is not yet cleaned up. A faction of the shareholders disbelieves thoroughly in the old management, and is endeavoring to secure a change. Notwithstanding poor management, and troubles of an unavoidable nature, in the past, property is regarded as valuable, and as having a promising future.

LYELL COMSTOCK CONSOLIDATED COPPER CO., LTD. TASMANIA.

Offices: 29, Great St. Helens, London, E. C. Eng., and Broken Hill Chambers, Queen St., Melbourne, Australia. Works office: Pillinger, Macquarie Harbour, Tasmania. H. Macdonald, local director; J. J. Muir, mine manager; C. A. Sack, secretary. Organized Dec. 29, 1878, as Mt. Lyell Comstock Copper Co., Ltd., and in March, 1903, absorbed the Tasman Lyell Copper Co., Ltd., and changed name to present title. Capitalization £600,000, shares £1 par; issued, £545,000. Lands, 300 acres, on Mt. Lyell, well located as to strike of ore bodies, and showing a considerable amount of ore of low to medium grades, best grade averaging 4.5% copper. Has a tramway, built to within 2 miles of the mine. Is suffering from lack of funds, and desires absorption by the Mt. Lyell Mining & Railway Co., Ltd.

LYELL PEAKS MINE. TASMANIA.

A prospect, in the Mt. Lyell district of Montagu county, Tasmania.

LYELL PIONEER CONSOLIDATED. TASMANIA.

A prospect, in the Mt. Lyell district of Montagu county, Tasmania.

LYELL THARSIS MINING CO. (NO LIABILITY). TASMANIA.

In liquidation. Lands sold to Mt. Lyell Mining & Railway Co., Ltd.

LYMNI COPPER MINING SYNDICATE, LTD. CYPRUS.

Offices: 32, Great St. Helens, London, E. C., Eng. Mine office: Limasol, Cyprus. L. P. Ford, chairman; Thos. Creswell, F. I. S., secretary; Chas. Christian, mine manager. Organized March 12, 1897, with capitalization £20,000, shares £1 par; issued, £16,542. Lands, 30 square miles, in the

Bellathousa district of Colis, Chrysokhow, Cyprus. Ore occurs as lenses, largest claimed to have a width of 400' and length of 1,400'. Claimed average ore values is 9% to 10% copper and 3 dwts. silver per ton, from bornite and chalcoppyrite. Is developed by 7 shafts, of 150' to 300' depth, and by a 2,100' tunnel. Ore formation apparently is continuous for 3 miles. Mine is not permanently equipped, and company's estimates of values are excessive. Presumably idle.

LYNGENFJORD KOBBERVAERK.**NORWAY.**

Owned by Norwegian-American Copper Mining and Smelting Co.

LYNN CREEK COPPER-GOLD CO., LTD.**BRITISH COLUMBIA.**

Office: 419 Hastings St., Vancouver, B. C. Mine office: Lynn Creek, Vancouver Island, B. C. G. L. Allan, president and treasurer; W. H. Pegram, secretary; W. Thos. Newman, general manager; G. Richardson, superintendent. Organized 1901, under laws of British Columbia, with capitalization \$300,000, shares \$5 par. Lands, 6 claims, area 200 acres, 8 miles from Vancouver, in the New Westminster district, showing 6 veins, of which 3 range from 5' to 40' in width, giving assays up to 8.9% copper, 3 oz. silver and \$1 gold per ton. Also has a 4' to 6' vein of zinc ore, opened by 2 tunnels, giving a back of 800' to 1,000'. Mine is claimed to have a large amount of ore in sight, and could ship ore by water to smelters at Crofton, Ladysmith and Van Anda. Idle for several years.

LYONS KYLE GOLD MINING & MILLING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Wm. Woods, superintendent. Property is the Tucker mine, carrying gold, silver, lead and copper. Has steam power, 5-stamp mill and a 50-ton concentrator.

MAADEN-KENI MINES.**TURKEY IN ASIA.**

Mine office: Baibourt, Trebizond, Turkey in Asia. Were operated, in a small way, by a Greek syndicate, at last accounts. Presumably idle.

MACBETH LEASING CO.**IDAHO.**

Office: care of Ravenel MacBeth, manager, Salt Lake City, Utah. Mine office: Mackay, Custer Co., Idaho. Property is the mine of the White Knob Copper Co., operated under lease.

MACKEY-BURROUGHS MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power.

MACKINAW COPPER CO.**IDAHO.**

Mine office: care of E. Daft, manager, Hailey, Custer Co., Idaho. Lands, 3 claims, well timbered and watered, 25 miles east of Hailey and connected herewith by a good wagon-road, at the head of Lost River, in the Lost River Mountains. Property shows a contact vein of 3' to 5' width, between limestone and porphyry, opened by a 100' shaft, showing chalcoppyrite assaying up to 15% copper, with quartz gangue.

MACKINAW MINING & MILLING CO.**WASHINGTON.**

Said to have sundry claims in Snohomish county, Washington, showing ore that gives fair assay values in copper and nickel. Idle.

MACKPAR SYNDICATE, LTD.**AUSTRALIA.**

Offices: 8, Regent St., London, S. W., Eng. T. D. C. Parker, and R. W. McKay, directors. Organized Jan. 13, 1906, with capitalization £3,600, shares £1 par, to take over the Mount Morgan copper mines, at Moonmera, New South Wales.

MADISONIAN MINE.**MONTANA.**

Office: care of Estate of Levi Z. Leiter, owner, Chicago, Ills. Mine office: Norris, Madison Co., Mont. E. J. Trerise, superintendent. Ores carry gold, silver and copper. Has steam power, concentrator and 60-ton cyanide plant.

GRUBE MAGDALENA.**GERMANY.**

Mine office: Morsbach, Rheinprovinz, Germany. Has lead, copper and iron sulphides. Is worked in a very small way, with trivial production.

MAGDALENA COPPER CO.**NEW MEXICO.**

Office: 34 First National Bank Bldg., Colorado Springs, Colo. Mine office: Magdalena, Socorro Co., N. M. Jos. C. Colligan, president; Edwin Arkell, vice-president; F. H. Dunnington, secretary and treasurer; E. S. Timmons, general manager; P. E. Johnson, mine superintendent. Organized March 7, 1906, under laws of Arizona, with capitalization \$2,500,000, shares \$5 par. Lands, 17 claims, area 340 acres, showing granite, porphyry and occasional limestone, carrying a fissure vein, opened by 4 shafts, of circa 80' average depth, giving ore ranging 3% to 10% copper, 5 oz. silver and \$2 gold per ton, with quartz gangue.

MAGENTA GOLD MINING CO.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. C. E. Barrie, superintendent, at last accounts. Has gold, silver and copper ores, and steam power.

MAGGIE MURPHY COPPER CO.**WYOMING.**

Office: 16 State St., Boston, Mass. Mine office: Douglas, Converse Co., Wyo. Employs 11 men. Hon. Chas. S. Ashley, president; John O'Neil, vice-president; A. D. Lee, secretary and general manager; Dr. F. M. Kennedy, treasurer; preceding officers, Geo. H. Hedge and Capt. Robt. A. Hammond, directors; L. Charles Lee, superintendent; Prof. H. C. Beeler, consulting engineer. Organized August, 1904, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued, \$625,000. Lands, 12 claims, area 180 acres, also a 60-acre millsite, all fairly timbered, on the northwest side of Horseshoe Cañon, in the Laramie Peak district, showing country rock of granite, fissured with diorite, gneiss and schists, carrying 7 contact veins between gneiss and mica-schist, of which one, under development, ranges 30' to 60' in width, carrying covellite, bornite and chalcopyrite, associated with pyrrhotite, opened by 9 pits and a 114' shaft, showing ore assaying 1% to 6% copper, 2 oz. to 9 oz. silver and 40 cents to \$4.50 gold per ton. Company plans continuous development.

COMPAÑIA MINERA DEL MAGISTRAL.**MEXICO.**

Mine office: Magistral, Chihuahua, Mexico. Lands, circa 400 pertenencias, 15 miles from the Chihuahua & Pacific railroad, showing a very wide ore body, occurring as a contact vein, with a limestone footwall and

eruptive hanging-wall. Ore is low in grade, as a rule, though occasionally fairly rich. About \$150,000 was spent on this property, circa 1902, with a net result of slightly benefiting the ventilation of the mine, after which the lands reverted to the original owners, who were doing a little development work, at last accounts. Main shaft, 300'. Ore values occur mainly in copper. Equipment includes steam and gasoline power, and a 150-ton smelter. Property must be worked on a large scale, to be profitable, as the average grade of ore is decidedly low.

MINAS MAGISTRAL y ANEXAS.**MEXICO.**

Office: care of L. H. Taylor, Jr., Philadelphia, Pa. Mine office: Ameca, Jalisco, Mex. Colin Timmons, superintendent. Lands, sundry claims near Las Moras mines, circa 12 miles southwest of Ameca, quite extensively developed, which have been makers of copper sulphate, in the past, from auriferous and argentiferous copper ores.

MAGISTRAL MINING CO.**MEXICO.**

Out of business. Formerly operated at Ameca, Jalisco, Mexico.

NEGOCIACION MINERA DEL MAGISTRAL, S. A.**MEXICO.**

Office: Apartado 22, Zacatecas, Zac., Mexico.

MAGISTRAL MINING SYNDICATE.**MEXICO.**

Office: 709 Lankershim Bldg., Los Angeles, Cal. Mine office: Etzatlan, Jalisco, Mex. Dr. M. D. Graves, manager. Lands include the Magistral, Eden and Refugio mines, one mile south of the Santo Domingo group.

MAGNETAWAN MINING CO.**ONTARIO.**

Office: care of R. S. Hews, secretary, Connellsville, Pa. Letter returned unclaimed from former mine office, Burks Falls, Parry Sound district, Ontario.

MAGNOLIA GOLD & COPPER CO.

Office: Seattle, Wash. Location of lands, if any, unknown. Moribund.

MAGPIE GOLD & COPPER MINING CO.**WYOMING.**

Office and mine: care of S. E. Ferree, secretary, Encampment, Carbon Co., Wyo. Otto Miller, president; A. N. Prosser, treasurer. Lands, sundry claims, on the south fork of the Encampment river, near Riverside. Idle.

MAGUS MINING CO.**WASHINGTON.**

Office: care of Alphonso Young, president, Washington, D. C. Mine office: Silverton, Snohomish Co., Wash. Lands, circa 24 claims, in the Stillaguamish district, showing auriferous and argentiferous copper ores, carrying values mainly in the precious metals. Equipment includes a water-power installation, with an electric plant and air-compressor. Property is said to have produced ore, averaging \$31 per ton, to the extent of circa \$100,000, when owned formerly by the Forty-Five Consolidated Mining Co., but was idle for 3 years, until taken over, June 1, 1905, by present company.

MAINE & MONTANA COPPER CO.**MONTANA.**

Office: Ft. Fairfield, Me. Mine office: Basin, Jefferson Co., Mont. Idle.

COMPAÑIA MINERA DE MAIPÚ.**CHILE.**

Office: Santiago de Chile. Operates El Volcan mine, opened 1884, in the department of Victoria, Chile. Ore occurs in a fissure vein, and is self-fluxing, giving average smelter returns of about 6% copper. Mine has an

excellent management, and is securing good results. Costs of mining and smelting are very low, net cost of copper delivered in London averaging about £30 per long ton. Annual production was about 1,500 tons fine copper, at last accounts.

JOAQUIN MAIZ y CA.

MEXICO.

Office and mine: Villa Aldama, Nuevo León, Mexico. C. Robles, manager.

SOCIÉTÉ ANONYME DES MINES DE CUIVRE

SERVIA.

DE MAJDANPEK.

Office: Brussels, Belgium. Mine office: Majdanpek, Servia. Employs circa 500 men. Emile Thorez, chairman; Emile Fromont, administrateur délégué; Charles Brundard, secretary; Leo Zenzes, general manager; Alfred Müller, smelter superintendent; Hugo Hermann, engineer. Organized 1903, under laws of Belgium and Servia, with capitalization 3,000,000 francs. Lands, 16,000 hectares, with trachyte and limestone country rocks, showing native copper, malachite, azurite, chalcopryite and iron pyrites. Company estimates 600,000 tons of ore in sight, with 250,000 tons blocked out for stoping. Smelter, $\frac{1}{2}$ mile from mine, and connected therewith by a Bleichert aerial tram, has three 40-ton Herreshoff water-jacket blast-furnaces, making blister copper, carrying 96% copper, 14 oz. silver and 1.5 oz. gold per ton. Company is erecting a new smelter of 200 tons daily capacity, to employ the Knudsen pyritic process.

MAJESTIC COPPER CO.

UTAH.

Office: care of Schirmer, Chapin & Emmons, Boston, Mass. Mine office: Milford, Beaver Co., Utah. Wm. B. Mucklow, president; E. E. Abercrombie, managing director; J. A. Ingols, superintendent. Employs circa 50 men. Organized August, 1904, as successor of Majestic Copper Mining & Smelting Co., with capitalization 400,000 shares; bonds, \$200,000. Old company, organized 1900, became insolvent April, 1904, and paid 60 cents on the dollar. Present management took charge facing an indebtedness of \$300,000, without treasury stock or credit, but with Samuel Newhouse as managing director, succeeded in rehabilitating the property.

Lands, 120 claims, area 2,450 acres, also an 80-acre smelter site and 1,100 acres miscellaneous lands, in 8 groups, located in 5 districts of Beaver county, Utah, showing about 100 ore bodies, in 20 or more different groups of mines and prospects. In addition to copper the ores carry gold, silver, platinum, lead, cobalt, bismuth, vanadium and uranium. Copper ores include all of the principal oxides, carbonates and sulphides, also occasional native copper, and many of the rarer copper minerals, ores ranging from 2% to 85% copper, with estimated average values of 12% copper, 12 oz. silver and \$3 gold per ton, with large percentages of lead, but these figures, made by the former 'boom' management, are much too high. There are 18 shafts, of 100' to 400' depth, also many tunnels and innumerable test-pits, with circa 6 miles of workings. Former management estimated 1,000,000 tons of ore in sight, with 500,000 tons blocked out for stoping, but these estimates were gross exaggerations, and must have been known to be such when put forth, while stock was being fed to the public. Some of the properties were worked

formerly for silver, but the silver-copper ores at and near surface gave way to copper-silver ores at depth, all ores being more or less auriferous.

The O. K. is the principal mine of the company. Selected shipments of 1,145 tons of O. K. ore gave net returns of \$95,000, a shipment of 258 tons in 1901 giving smelter returns of 40% copper, 7.5 oz. silver and \$3.80 gold per ton. The O. K. group has 7 claims, opened by a 3-compartment main shaft of 400', showing a vein ranging up to 28' width, with considerable development on the 300' and 400' levels. Also has an undeveloped ore body apparently about 250' wide, which is a stockwerk, with stringers carrying high-grade ores. The O. K. has considerable ore blocked out, mainly by the present management.

The Old Hickory group, 9 claims, with a gossan capping circa 250' wide, above a vein of 40' to 200' width, is opened by a short tunnel and by about 50 pits and shafts, deepest 212', showing ores carrying 4% to 5% copper, with gold and silver values estimated at \$2 to \$4 per ton. Equipment includes a 34-h. p. Fairbanks-Morse electric hoist, Ingersoll-Sergeant air-compressor and Rand rock drills.

The Harrington-Hickory group, 25 full and fractional claims, has two 400' shafts and circa 40 pits and shallow shafts showing ore. Main shaft has 3 compartments. This group shows numerous fissure veins intersected by cross-veins, both approximately vertical, and in addition has a series of bedded veins dipping at 30° to 35°, giving three separate intersecting systems of ore bodies. Principal values are in lead, ores giving assays of 2% to 3% copper, 25% to 50% lead and up to 50 oz. silver and \$1 gold per ton.

The Vicksburg group, 4 claims, formerly mined for gold, shows three 2' to 20' vertical fissures, with mineralized cross-veins, opened by numerous shallow pits and shafts, with a 2-compartment working shaft.

The Hoosier Boy group, 10 claims, has a 250' vertical shaft, in limestone, showing auriferous and argentiferous copper-lead ores. The Larkspur group, 8 claims, shows a 60' contact vein between granite and limestone, carrying irregular bunches of high-grade ore. The Copperfield group, 17 undeveloped claims, lies between the O. K. and the Old Hickory mines. The Apex group, 4 claims, adjoins the Old Hickory, and there also is an undeveloped group, known as the Ben Harrison.

The mine has steam, gasoline and electric power, and an undeveloped water power on Beaver river, 35 miles distant, is believed to be capable of generating about 2,000 h. p., and transmitting same electrically to the mine and smelter, at a cost of about \$100,000.

The reduction works, at Lewisville, 3 to 8 miles from the various mines, built by the Colorado Iron Works Co., includes a sampling mill and smelter with a 250-ton copper furnace and a 100-ton lead furnace, with Nesmith hot-blast stoves that heat the blast to 800° Fahrenheit, before entering the tuyeres. The smelter building is of steel frame, on stone foundations, and is large enough to accommodate four 250-ton furnaces, with necessary machinery. The townsite of Lewisville was platted by the company. The mines and smelter are served by the Oregon Short Line railway. The build-

ing of a concentrator at the O. K. mine has been considered. On a test run, 1905, under the honest and capable management of Mr. Newhouse, ores gave average returns of 5.1% copper, 3.8 oz. silver and \$1.20 gold per ton. This shows how misleading were the smelter shipments and estimates of the former management. Ore is being sent to the Newhouse mill, and, in June, 1906, it was planned to ship 3 tons of concentrates weekly to the Murray smelter, in preference to blowing in the company's own smelter on an inadequate tonnage. The smelter ran for 40 days only, under the previous management, giving only half the claimed duty, and smelted only 5,000 tons of the 500,000 tons claimed to be blocked out for stoping at that time, when it ran out of ore and closed down. The former fiscal agents were Chapman, Mucklow & Bosson, of which firm the present president was a member. This firm is said to have received 40% commission on stock sales. Senator A. B. Lewis also was connected with the promotion. Under competent management the Majestic should make a good mine, in time, and the work of the new company seems to have been done sensibly and economically.

MAJESTIC COPPER MINING & SMELTING CO.

UTAH.

Succeeded, circa 1904, by Majestic Copper Co.

MALACHITE COPPER CO.

ARIZONA.

Mine office: Williams, Coconino Co., Ariz. J. F. Durlin, secretary. Lands, sundry claims, north of Williams. Idle.

MALACHITE COPPER-GOLD CO.

CALIFORNIA.

Office: 209 Homer Laughlin Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Daggett, San Bernardino Co., Cal. S. A. Barrett, president; Jos. B. Cook, secretary; W. E. Steadman, superintendent. Organized under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area 100 acres, in the Ord district of San Bernardino county, opened by a 165' shaft, on a 34' vein carrying an 8' pay-streak, said to assay 7.5% copper and \$3 gold per ton. Idle.

MALAGON GROUP.

SPAIN.

Mine office: Puebla de Guzmán, Huelva, Spain. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager. Property is a group of government concessions, showing many old workings and excellent outcrops. Idle.

MALLERY MINE.

BRITISH COLUMBIA.

Sold, circa 1906, to Britannia-West Copper Co., Ltd.

MALONEY-BLUE LEAD COPPER MINING & SMELTING CO.

SOUTH DAKOTA.

Mine office: Sheridan, Pennington Co., S. D. John Harman, manager; Philip Harman, superintendent. Organized 1899, with capitalization, variously reported, of \$750,000 or \$3,000,000, shares \$1 par. Lands, 380 acres, 345 acres patented, showing a vein of 118' claimed width, surmounted by a heavy gossan, carrying occasional rich oxidized ores containing good copper and gold values. Development is by a 260' shaft, showing occasional stringers of ore, and a 1,610' tunnel, showing some arsenopyrite. Developments to date have not shown copper in paying quantities, but payable ore is be-

lieved to exist below the water-level. Equipment includes a steam power plant and air-compressor.

MAMMOTH COPPER CO.

A brazen swindle, perpetrated by the Wm. F. Wernse gang, of St. Louis.
MAMMOTH COPPER MINING CO. WYOMING.

Letter returned unclaimed from former mine office, Saratoga, Wyo.
MAMMOTH COPPER MINING CO., OF MAINE. CALIFORNIA.

Office: 50 Congress St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Employs 200 men. Robert D. Evans, president; A. F. Holden, managing director; Fredk. Lyon, manager; A. P. Anderson, mine superintendent; R. D. Rhodes, smelter superintendent; Jas. Kerwin, assistant smelter superintendent; Geo. K. Fischer, consulting metallurgical engineer. Was organized under laws of Maine, and is a subsidiary corporation of the United States Smelting, Refining & Mining Co., which controls the entire stock issue.

Lands, 14 claims, area 280 acres, also an 80-acre smelter site, and miscellaneous lands giving total holdings of 1,400 acres, $3\frac{1}{2}$ miles from Kennett, on Little Backbone creek, in the Big Backbone district. Lands are well timbered, with numerous mountain streams available for water supply, and the topography is very rugged, the mines being opened near the tops of the mountains. Principal property is the Mammoth mine, showing a prominent gossan outcrop, but holdings also include the Golinsky group, 12 miles from Kennett, bought 1904, with 750' of workings on a 30' vein giving fair average assay values. Country rock of the Mammoth mine is rhyolite, somewhat altered, in places, with some slate and considerable porphyry, carrying large flat-lying lenses of ore that is mainly slightly zinciferous chalcopyrite, containing an average of circa 3% copper, 2 oz. silver and 60 cents gold per ton, with about 40% iron and up to 40% sulphur. Development is exclusively by tunnels, of which there are 3, showing several ore bodies, of which the largest is 228' wide, circa 500' long, and has been opened to 200' depth. The mine has about 2,000,000 tons of ore in sight, and extensive diamond drilling is to be done during 1906. Extraction is through tunnels, having ore-bins at the portals, with an aerial tram leading to the smelter. Equipment includes two 15-drill Rand air-compressors, and 28 power drills. Water is piped to the mine and smelter from the Mayflower claim. Buildings at the mine include a smithy, boarding-house, etc. Both mine and smelter are run by electric power, secured, at a low rate, from the Northern California Electric Light & Power Co., the mine using 200 h. p. and the smelter 700 h. p.

The smelter, $\frac{1}{2}$ mile from Kennett, and $2\frac{1}{2}$ miles from the mine, is located on a highly favorable site of 80 acres, once held by the Trinity Copper Co. The plant is entirely of steel, and is the second largest in California, costing, complete, nearly \$500,000. Full capacity is circa 1,000 tons daily. All material is handled by gravity, and the plant is operated on three 8-hour shifts.

Ore is taken from the mines and smelter by an aerial tram of 13,200' length. The line is in two sections, the upper section having a grade of

22% from the mine to the midway station, the tram being operated by gravity, in counterbalance, and power generated by a retarding engine actuates an air-compressor. The lower section has sufficient grade for the loaded buckets to bring back empties. The tram has a capacity of 1,600 tons in 24 hours, carrying 1,100-lb. buckets at intervals of 150', with wooden supporting towers at intervals of 100'.

The buildings of the smelter plant are of steel throughout, and include a bin-house for storing ore, coke and limestone. This is 214' long, and is equipped with 27 scales, for the individual weighing of cars in train-loads. Capacity of the bin-house is 2,500 tons of custom ore and 1,000 tons of fluxing ore, in addition to coke and limestone.

The blast-furnace building, 70x130', has three 325-ton water-jacket blast-furnaces, of which two are run regularly, the third being held in reserve, as the furnaces freeze occasionally, because of the considerable percentage of zinc contained in the ore. The building has two floors, the upper for charging and the lower for tapping.

The power building, 50x80', has 3 blowers, direct-connected to 200-kw. motors, with a capacity of 18,000 cubic feet of cold blast per minute. Fumes from the furnace are taken by individual goosenecks to a hopper-bottom dust-chamber, 280' long, leading to a self-supporting steel stack of 12' diameter and 150' height, set on a concrete base. Underneath the dust-chamber is an electric tram-line, leading to the briquetting-plant, where fines and flue-dust are briquetted for resmelting. Slag is dumped hot, the plant having a slag-line and electric locomotive.

Water is brought to the smelter by a 2-mile flume, and the Northern Pacific railway has a spur to the works. Miscellaneous equipment includes a well fitted machine-shop, office, laboratory and a complete sampling-mill. Fuel is coke, costing \$12 per ton, and owing to excess of sulphur in the ore, only about 4% coke charges are required, giving cheap fuel costs. Wood, costing \$3 per cord, is used to a slight extent. Product of the furnace is an auriferous and argentiferous matte of about 40% copper tenor, shipped for reduction to the Utah smelter of the United States company. In addition to treating its own ores, the Mammoth smelter is buying silicious custom ores, for fluxing, from Utah and Nevada mines, including rich gold-silver ores from the Tonopah camp, and probably will take Oregon ores to a considerable extent also.

The first furnace of the smelter was blown in, October 6, 1905, and a second and third shortly thereafter. Early in 1906 it was planned to double the capacity of the smelter, which, in June, 1906, was producing at the rate of about 1,250,000 pounds fine copper per month. The property is being handled in a manner that leaves little ground for criticism or suggestion, and is certain to become, within a comparatively short time, one of the large copper producers of the United States.

MAMMOTH COPPER & SMELTING CO.

ARIZONA.

Letter returned unclaimed from former mine office, Red Rock, Pinal Co., Ariz. Described in Vol. IV.

MAMMOTH GOLD MINING CO.**COLORADO.**

Office: 1104 Marquette Bldg., Chicago, Ill. Mine office: Central City, Gilpin Co., Colo. W. H. Paul, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

MAMMOTH HILL GROUP.**ARIZONA.**

Mine office: Safford, Graham Co., Ariz. Idle.

MAMMOTH LODS MINING CO.**BRITISH COLUMBIA.**

An Oregon corporation, owning the Colorado group of claims, in the Cascade Mountains, Yale district, British Columbia. Veins are claimed to run from 40' to 250' in width, and to be traceable for more than two miles, and it is claimed that smelting tests have given 15% to 20% copper and \$12 gold per ton, these figures being, in themselves, ample evidence of their own untruthfulness or of the unfair nature of the "test."

MAMMOTH MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Dragoon, Ariz.

MAMMOTH TUNNEL & MINING CO.**COLORADO.**

Office: 403-331 Fourth Ave., Pittsburg, Pa. Mine office: Silverton, San Juan Co., Colo.

MAMMOTH MINING CO.**UTAH.**

Office: Hooper Blk., Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. Employs 125 men. Samuel McIntyre, president and general manager; Samuel McIntyre, Jr., vice-president and superintendent; R. M. Wilkinson, secretary. Organized under laws of Utah, with capitalization \$400,000, shares \$1 par, and, in March, 1906, planned reincorporation, under laws of Nevada, with capitalization \$1,000,000, shares \$1 par. Incorporation in another state will give the advantage of trial in the Federal courts, in case of litigation.

The Mammoth mine, in the Tintic district, is opened to a depth of circa 1,200', and is a considerable producer of auriferous and argentiferous lead and copper ores, values being mainly in silver and lead. Has steam power and a 60-stamp mill. For 1904, receipts from all sources were \$309,370, with net earnings of \$105,340, from which dividends of \$118,537 were paid.

MANASSAS-GAP COPPER-MINE, INC.**VIRGINIA.**

Office: 25-33 Broad St., New York. Mine office: Reager, Rappahannock Co., Va. Geo. B. Wright, president; Hon. John S. Wise, vice-president; Henry P. Porter, secretary; Powhattan Weisiger, treasurer; R. R. Crook, superintendent. Organized Oct. 30, 1903, under laws of Virginia, as a reconstruction of the Carter Copper Co., with capitalization \$999,000, shares \$1 par. Lands, 700 acres, freehold, including about 400 acres of timber land, in Fauquier county, Virginia, showing a volcanic formation, carrying two contact veins between Cambrian sandstone and Silurian slates, ranging 3' to 11' in width, said to give average assays of 5% copper, 10 oz. silver and \$4 gold per ton, from malachite, bornite and chalcopyrite, associated with occasional native copper. Has about 600' of underground openings. Two railroads are within 3 and 6 miles, respectively. Idle.

MANCAYAN COPPER SYNDICATE, LTD.

Voluntarily wound up, August, 1902.

MANCHESTER ZINC & COPPER CO., LTD.

Voluntarily wound up, April 15, 1901.

MANHATTAN COPPER MINING CO.**ARIZONA.**

Merged, 1902, in Troy-Manhattan Copper Co.

MANHATTAN COPPER MINING & MILLING CO.**NEVADA.**

Office: care of Hon. A. B. Lewis, president, 100 Broadway, New York. Mine office: Pioche, Lincoln Co., Nev. E. F. Freudenthal, manager. Was controlled, at last accounts, by the Nevada-Utah Mines & Smelters Corporation, and apparently succeeded the Manhattan Gold & Copper Mining Co. Lands, 2 groups, one east of Pioche and one in the Stampede Gap section. The Pioche group includes the Revenue, Telephone and Alps mines, with shallow development, by 100' and 140' shafts, showing ore giving good assay values in gold and silver. The Stampede Gap mine is opened by 2 tunnels, obtaining a maximum depth of 400', with circa 2,000' of openings, and is sinking a new working shaft, equipped with 12-h. p. Fairbanks & Morse gasoline hoist. Property shows auriferous and argentiferous copper and lead sulphides.

MANHATTAN DEVELOPMENT CO.**ARIZONA.**

Office: Post Office Blk., Houghton, Mich. Mine office: Paradise, Cochise Co., Ariz. J. H. Rice, president; W. G. Rice, secretary and treasurer; preceding officers, Thomas F. Cole, Nathan M. Kaufman, Samuel R. Kaufman, Allen F. Rees and Norman W. Haire, directors; Fred. W. Hoar, superintendent. Organized March, 1905, under laws of Arizona, with capitalization \$200,000, shares \$10 par; \$5.50 paid in. Lands, 37 claims, area 600 acres, fully paid for, in the California district, carrying upwards of 2 miles of the outcrop of a mineralized zone lying west and north of the holdings of the Chiricahua Development Co. Development is by several shallow shafts, deepest 80', and a 450' crosscut tunnel, latter showing leached ore and a little high-grade ore, with indications of permanent values at greater depth. Management is good, and property is considered promising.

MANHATTAN GOLD & COPPER MINING CO.**NEVADA.**

Apparently succeeded, circa 1905, by Manhattan Copper Mining & Milling Co.

MANHATTAN GROUP.**ARIZONA.**

Letters returned unclaimed from former mine office, Cave Creek, Ariz.

MANICA COPPER DEVELOPMENT CO., LTD.**MOZAMBIQUE.**

Office: Finsbury Pavement House, London, E. C., Eng. M. F. Armstrong, chairman; J. S. Park, mine manager; W. E. Lane, secretary. Organized May 26, 1902, with capitalization £150,000, shares £1 par; issued, £115,000. Lands, 411 claims, area circa 900 acres, in Manicaland, Mozambique. Three copper outcrops have been located, one of which, opened to depth of 200', is said to be promising.

MANICA COPPER EXTENSION, LTD.**MOZAMBIQUE.**

Registered, 1903, with capitalization £1,000. Moribund.

MANICA EXPLORERS, LTD.**MOZAMBIQUE.**

Offices: 615, Salisbury House, London, E. C., Eng. Organized Jan. 23, 1896, under laws of Guernsey, as reconstruction of Western Explorers, Ltd., with capitalization £100,000, shares £1 par; issued, £52,400. Lands include 200 copper claims, 770 gold claims, 16 acres of townsite lands and circa 25,000 acres of miscellaneous lands, said to be rubber-bearing

MANILA GROUP.**ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. Lands, sundry slightly prospected claims, about 3 miles from the Chiricahua Development Co.

MANILLA MINING CO.**ARIZONA.**

Office: care of N. L. Houston, manager, Peoria, Ills. Mine office: Ft. Huachuca, Cochise Co., Ariz. Lands, sundry claims in the Huachuca Mountains, opened by a 220' shaft, showing argentiferous copper and lead sulphides. Has a steam plant, with hoist, pump and air-compressor.

MANITOU MINING CO.**MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Operating office: Calumet, Mich. Mine office: Delaware Mine, Keweenaw Co., Mich. Quincy A. Shaw, Jr., president; Rudolph Agassiz, vice-president; preceding officers, Alexander Agassiz and Francis L. Higgison, directors; Jas. MacNaughton, general manager; Geo. A. Flagg, secretary and treasurer; Will J. Penhalegon, superintendent. Organized June 26, 1905, under laws of Michigan, with capitalization \$500,000, shares \$25 par.

Lands include the old Delaware mine, also known variously as the Conglomerate and Lac La Belle mine. The Delaware tract contains circa 3,700 acres of mineral lands, and upwards of 17,000 acres of miscellaneous lands, with a water frontage of 10 miles on Lake Superior, and the entire frontage on Lac La Belle. The property has been tested by diamond drill borings, and an amygdaloidal bed, identified as the Kearsarge lode, has been located and 3 pits, deepest 65', sunk thereon, giving an encouraging showing of copper. The Kearsarge bed is 7,800' southward of the base of the greenstone bed. Principal development is on the amygdaloid bed previously known as the Montreal River lode, lying 1,770' south, on surface, of the base of the greenstone bluff. A shallow shaft, sunk circa 1899, in the middle of the Southwest quarter of Section 15, Town 53 North, Range 30 West, has exposed this lode, and this shaft had been deepened to circa 100', at the end of 1905. The lode dips at about 28°, and is 12' to 14' in width, showing copper in unusually promising quantities.

The old Delaware mine, opened on the Allouez conglomerate bed, has 4 shafts of 300' to 900' depth. The Allouez lode underlies the greenstone and dips northward at an angle of 25° 30'. The mine on the conglomerate was tested extensively, at a cost of about \$1,700,000, by the former owners, but was not found profitable.

MANITOU MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Bonanza, Colo.

"MANN" GROUP.**ARIZONA.**

Office and mine: care of Otto W. S. Schley, owner, Vail, Pima Co., Ariz.

Lands, 4 claims, area 80 acres, in the Helvetia district, 9 miles southeast of Vail and 28 miles southeast of Tucson, formerly held by the Bradford Development Co., showing a formation of Carboniferous limestone, intruded by porphyry dikes, latter considerably altered, showing extensive outcrops of oxide and carbonate ores, succeeded at a little depth by sulphides. Property shows several veins of 6" to 5' width, and is opened by a 2-compartment shaft of 105', in porphyry, showing stringers of quartz carrying copper sulphides. Shipments of 100 tons, to the El Paso smelter, gave returns of 9.5% to 17% copper, 8 oz. to 16 oz. silver and \$8.50 gold per ton. The ore carries an excess of iron, and smelts readily.

**MANSFELD'SCHE KUPFERSCHIEFERBAUENDE
GEWERKSCHAFT.**

GERMANY.

Mine office: Eisleben, Prussian Saxony, Germany. Dr. Ferdinand Zirkel, Dr. Dittrich and Dr. Paul Wachler, executive committee; Herman Schrader, smelter superintendent. Organized 1852, as a consolidation of numerous independent operators, and reorganized, April, 10, 1876, with 69,120 shares. Employs 16,192 mine workers, and 2,505 smelter workers, with a total force of 22,262 men.

The Mansfeld copper mine was opened A. D. 1199, and, under the Counts of Mansfeld attained a high state of development, and was immensely profitable, during the Fourteenth and Fifteenth Centuries, but the industry almost suffered extinction during the Thirty Years' War. Activity was resumed in 1671, when the right of working the mines was declared free, this resulting in the building up of a great number of small independent operators. The present company was first formed, in 1852, as a consolidation of the various small mine operators and smelters, and the merging of many small interests has resulted in an increase of production, from 2,660 metric tons in 1867, to 18,882 metric tons fine copper in 1904.

The principal ore is slightly argentiferous chalcopyrite, associated with limited quantities of nickel and cobalt ores, occurring as speiss, disseminated in very fine grains through the kupferschiefer, a fine-grained bituminous shale. The kupferschiefer lies nearly horizontally, with a dip of 5° only, and ranges from 2' to 3' only in thickness, but covers nearly 200 square miles. Lying just below the kupferschiefer is an arenaceous shale, carrying chalcopyrite, and a limited quantity of copper carbonates. Owing to the thinness of the bed, and the great age and extent of the workings, it is necessary for miners to work on their sides, bellies or backs, as in coal mines, wearing boards upon their trunks and thighs, in order to protect themselves from the rock floors. Owing to the great age and extent of the workings, the headings usually are 2 to 4 kilometers from the shafts, hence the actual mining is done under considerable disadvantages. The workings are of vast extent, and there are scores of old and abandoned shafts. Present mining operations are through 9 hoisting shafts, with a large number of shafts for water and ventilation. Among the new shafts are the Johannes, at Hohenthal, and the Hermann, at Helbra. The mines have six duplex Weisse & Monaki pumps, and a full equipment of hoisting engines and general mining ma-

chinery. The company maintains independent machine shops, capable of building and repairing any mining or pumping machinery in use.

The Mansfeld has numerous reduction works, including 4 smelters for raw ores, 2 roasting smelters with acid plants, 2 matte smelting works, 2 refining furnaces, and one electrolytic refinery with desilverizing plant. The various works have a total of 20 reverberatory furnaces. The principal smelters are the Krughütte, at Eisleben, with 4 furnaces; the Kochhütte, at Helbra, with 4 furnaces; the Eckhardthütte, at Leimbach, with 4 furnaces, and the Kupferkammerhütte, at Hettstedt, with 3 furnaces. All of these furnaces are of circular shaft type, with forehearths, and use cold blasts, except the Kupferkammerhütte, where hot blast is employed to some extent. The Saigerhütte is a refining plant, and the Gottesbelohnungshütte has 10 reverberatory furnaces. The Krughütte, near the mine, is equipped with Steinbeck circular multiple-hearth automatic pyritic calciners, which use no carbonaceous fuel, except for preliminary charges. The Eckhardthütte has one lead stack, producing a silver-lead matte, and making a little nickel speiss from resmelted fluedust. The Eckhardthütte has 72 kilns and 5 lead acid chambers, and the Kupferkammerhütte has 82 kilns and 6 lead acid chambers, these works making 2,212 metric tons of 50° Beaumé sulphuric acid, in 1903, from the fumes of the ore and matte treated.

The method of reduction followed at the Mansfeld is by heap-roasting and calcining in shaft-furnaces. Roast-heaps are built about 60 metres long, 5.5 m. broad at the bottom and 3 m. broad at the top, and only about 1.50 m. to 1.75 m. high. The only fuel used is a little brushwood, at the edges and bottoms of heaps, and each heap is roasted 4 to 6 weeks. If the ore, as produced, carries any fines, these are screened, briquetted and added to the roast-heaps. The roasting reduces the ore 8% to 20% in weight, and the roasting is more for the elimination of carbon dioxide and bituminous matter, than to throw off sulphur, the latter running only 2% to 5% in the raw ore, while the bituminous matter ranges 10% to 17%, and CO_2 is 7% to 13%. There are 4 roast-stalls near the shafts, and at the furnaces the first-fusion product is a matte carrying circa 40% copper and 0.25% silver. This matte is broken up and roasted in 2 calcining kilns, and the roasted matte, with the addition of 5% to 10% raw matte, is smelted, in reverberatory furnaces, to white metal carrying 74% to 75% copper and 0.45% to 0.50% silver. The slags from the white metal carry 9% to 15% copper, and are returned to the shaft-furnaces. Slag is utilized extensively, in the manufacture of slag-brick and paving blocks.

The desilverizing plant, at the Saigerhütte, operates on the Ziervogel method, roasting the matte and retaining the silver as a sulphate, which is dissolved in water and the solution run over metallic copper, which precipitates the silver, the cement silver so secured being pressed and resmelted to metal .999 fine. The final furnace product, after the extraction of the silver, is a blister copper 99.7% to 99.8% fine. In 1903 the Mansfeld smelters treated 686,354 metric tons of ore, making therefrom 49,179 tons of low-grade matte, the average tenor of the ore being 28.19 kgs. copper and 0.156 kgs. silver per

ton. Production, 1904, was 41,629,349 lbs. fine copper, and in 1905 was 43,824,141 lbs. fine copper.

In addition to its mines and smelters, the Mansfeld company has extensive industrial undertakings of a collateral and subsidiary nature, the more important of these being extensive coal mines and coke works at Hamm, Westphalia, also alkali deposits and works. The company is handled with great technical skill, and the Mansfeld is an excellent object lesson in the management of a large, low-grade mine.

MINA MANTO VERDE.

CHILE.

A promising property, in the Tierra Amarilla district of Chile, under private ownership.

MARAVILLA COPPER CO.

ARIZONA.

Letter returned unclaimed from former office, Providence, R. I. Mine office: Safford, Graham Co., Ariz. Wilbur H. Powers, president; S. S. Campbell, manager; Chas. B. Spaulding, superintendent. Lands, sundry claims, in the Gila range, circa 10 miles north of Solomonville, including the Lone Star mine, opened by a 500' main shaft, showing a 5' vein of sulphide ore, of high grade at bottom, carrying copper, silver and gold values, latter small. Is said to have a considerable showing of 8% to 10% sulphide copper ore. Idle for some years.

MARBLE BAY MINING CO.

BRITISH COLUMBIA.

Mine sold to the Tacoma Company.

MARGUERITA MINE.

CALIFORNIA.

An old and idle property, near Almaden, California, operated circa 1865.

MARICOPA COPPER CO.

ARIZONA.

Letter returned unclaimed from former office, St. Louis, Mo.

MARICOPA COPPER MINES CO.

ARIZONA.

Letters returned unclaimed from former mine offices, Wickenburg and Morristown, Maricopa county, Arizona.

MARIETTA GOLD MINING CO.

IDAHO & WASHINGTON.

Office: care of Lawson Investment Co., 60 State St., Boston, Mass. M. E. Lawson, president and general manager; H. C. Lawson, secretary. Organized under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Lands include gold claims in Ferry county, Washington, and the Atlas group of 5 claims, area 100 acres, in the Stevens Peak district of the Cœur d'Alenes, Shoshone county, Idaho. Development is by a 250' tunnel, claimed to show a 20' ore body, averaging \$50 per ton in copper, gold and silver values. Presumably idle.

MINA MARIPOSA.

MEXICO.

Office and mine: care of Thomas F. Rowe, Tapalpa, Jalisco, Mex. Lands, sundry claims, circa 9 miles southwest of Tapalpa, showing a 3' vein giving assays of 7% copper and 1 oz. gold per ton.

MARIPOSA MINE.

ONTARIO.

Letter returned unclaimed from former mine office, Massey Station, Algoma, Ont. An idle prospect, adjoining the Copper Queen of Ontario.

MARITIME COPPER & REDUCTION CO.**NEW BRUNSWICK.**

Mine office: Goose Creek, St. John Co., N. B. An old property, showing a large body of low grade ore. Idle since 1902.

MARKEEN COPPER CO.**ARIZONA.**

Dead. Lost lands, 1903. Fully described in Vol. IV.

MARQUETTE & ARIZONA MINING CO.**ARIZONA.**

Office: Marquette, Mich. Mine office: Bisbee, Cochise Co., Ariz. Emil Marks, president and general manager; Jos. J. Wirtz, secretary. Organized Dec. 6, 1902, under laws of Arizona, with capitalization \$500,000, shares \$5 par. Lands, 37 claims, area 740 acres, adjoining the Copper Glance on the east. Has shafts of 28' and 560', also sundry pits, showing copper stains and iron. Tract has a heavy conglomerate capping, much similar to that of the Copper Glance. Main shaft has 2 compartments, substantially timbered, passing through limestone showing considerable iron, and is quite wet, much of the shaft showing country rock assaying about \$2 gold per ton. The shaft has short north and south drifts, on the 400' level, and one short drift on the 145' level. Has a 35-h. p. hoist. Idle since 1903.

ANGEL MARQUEQUEL**BOLIVIA.**

Mine office: Coro Coro, La Paz, Bolivia. Works a conglomerate carrying native copper. Has steam power.

MARTHA WASHINGTON MINE.**UTAH.**

Mine office: Silver City, Juab Co., Utah. Ores carry mainly silver values, with 2% to 3% copper.

GRUBE MARTINI.**GERMANY.**

Office: care of W. Von Vloten, Hoerde in W., Rheinprovinz, Germany. Has spathic iron ore and chalcopryite, output being mainly iron, of which the production averages about 7,000 tons yearly. Has steam power and employed 60 men, at last accounts.

MASCOTA MINING CO.**MEXICO.**

Office: Chicago, Ills. Mine office: Talpa, Jalisco, Mexico. Harry S. Church, vice-president and general manager. Lands, 32 pertenencias, 9 miles west of Talpa, in the cañon of the Ocotlán river, known as the Ocotlán mine. Property is heavily timbered, furnishing fuel for ordinary mine operations. Mine shows a vein of 20' to 60' width, with a paystreak of 4' to 20', carrying auriferous and argentiferous copper and zinc sulphides. Development is by tunnels and shafts, showing a considerable quantity of ore. Property has been worked previously, by German and Mexican companies. Power is furnished from the Ocotlán river. An experimental leaching plant was built in 1905. Smelter has roasting furnaces and a water-jacket blast-furnace. Heretofore the zinc values have been lost, but an effort will be made to save them. Property is considered promising.

MASCOT MINING CO.**ARIZONA.**

Office: 1318 Majestic Bldg., Detroit, Mich. Mine office: Willcox, Cochise Co., Ariz. Dr. B. R. Hoyt, president; W. C. Rohms, vice-president; J. A. Zahn, treasurer; D. D. Jayne, secretary; preceding officers and F. F. Fehlig, directors; C. W. Courtney, superintendent. Capitalization \$1,000,000,

shares \$1 par; issued, \$229,000. Lands, 23 claims, area 460 acres, lying circa 40 miles northeast of Willcox, in the Montezuma and Clark districts, in the western part of Graham county, 3 claims being owned outright and 20 held under a \$37,000 bond and lease, on which \$31,000 has been paid. Lands are in 4 groups, located within 4 miles of each other. The Gold Cord group shows a vein of 6" to 22" width, opened to depth of 170', carrying 1% to 3% copper and high gold values, giving total assay values of \$49 to \$94 per ton, with circa 1,300' of openings. The Iron Bell group, 9 claims, has a shallow shaft, showing ore assaying 1% to 16% copper and circa \$20 gold per ton, with small silver values, and prospects of better copper values at depth. A group of 5 claims, 1½ miles from the Gold Cord, shows a 4' vein opened to depth of 85', giving assay values of \$20 to \$40 per ton in lead, silver and gold. Ores are malachite, azurite and chalcocite. Property has steam power, an engine-house, smithy, boarding-house and bunk-house, and is 22 miles from the nearest railroad point, Fort Thomas, on the Gila Valley, Globe & Northern railway.

MASCOT TUNNEL CO.

COLORADO.

Mine office: Turret, Chaffee Co., Colo. Elmer E. Briggs, superintendent, at last accounts. Ores carry gold, silver and copper.

MASHELL COPPER MINING & REDUCTION CO.

WASHINGTON.

Office: 437 Banigan Bldg., Providence, R. I. Mine office: Etonville, Pierce Co., Wash. C. J. McCormick, president; J. M. Mansfield, secretary and treasurer. Limited development work has shown several small veins, giving good assay values in gold and copper. Idle for several years.

MASON & BARRY, LTD.

PORTUGAL.

Offices: 87, Cannon St., London, E. C., Eng. Mine office: Pomarao, Alemtejo, Portugal. Sir Francis Tress Barry, chairman; James Francis Mason, J. P., deputy-chairman; Edward O. Barry, secretary; W. Neville, mine manager. Organized June 2, 1892, (as a reconstruction of company of same name organized June, 1878,) with capitalization £210,000, shares £1 par; issued, £187,172. Capitalization has been reduced from £1,050,000, by returning to shareholders £1 per share, on four different occasions. Has paid dividends regularly, since organization, these ranging from 3s. to 13s. per annum, dividends for the last few years having been as follows: 1901, 13s.; 1902, 11s.; 1903, 7s.; 1904, 7s.; Total profit for year 1904 was £74,932. The company has a staff pension fund.

Property is the San Domingos mine, originally opened and extensively worked by the Romans, operated by present company, and its predecessors, since 1858. Mine is opened for a width of about 200' and a length of about 2,000'. Product is cupriferous pyrites, carrying slightly under 1% copper, and 50% sulphur, principal values being in the sulphur rather than in the copper. After being burned for sulphur, the cinder is leached for copper values. The copper contents of the ores are decreasing slowly, but steadily.

The mine has 700,000 tons of ore in heaps, containing circa 4,000 long tons fine copper. Reserves of ore, at end of 1904, were 5,250,000 long tons,

down to the 180 metre level, with every reason to believe in the continuance of large ore bodies at much greater depth. Considerable trouble has been experienced from fire, in the west end of the 150-metre level, and the burning portion of the mine has been walled off. Production, 1905 was 6,088,320 lbs. fine copper. Property is carefully managed, and has a long and honorable record as a producer.

MASON VALLEY COPPER CO.**UTAH.**

Office: presumably Salt Lake City, Utah.

MASSASOIT GOLD & COPPER CO.

Office: 7 Water St., Boston, Mass.

MASSASOIT MINING CO.**UTAH.**

Office: care of E. V. McGarrick, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Name was changed, 1905, from Red Wing Extension Mining Co., to present title. Lands, 120 acres, adjoining the Red Wing, showing a 4' vein, giving average assays of circa 0.5% copper, 7% lead and 8.5 oz. silver per ton. Mine is said to show about 60,000 tons of ore.

MASS CONSOLIDATED MINING CO.**MICHIGAN.**

Office: 1105-6 Beacon St., Boston, Mass. Mine office: Mass, Ontonagon Co., Mich. Employs circa 300 men. Chas. A. Lamb, president; J. Walter Davis, vice-president; Wilfred A. Bancroft, secretary and treasurer; Jas. M. Wilcox, superintendent; preceding officers, F. W. Hunton, Chas. W. Riley and Geo. A. W. Dodge, directors; Joseph Satterley, mill superintendent; W. A. Brown, clerk; E. Fenner Douglass, engineer; Thomas Hall, mining captain; Truman G. Edwards, auditor; Samuel V. Rawlins, master mechanic at mine; Jas. Richards, master mechanic at mill.

Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; paid in, \$19. Has 2,563 shares in the treasury. Annual meeting, second Thursday in March. American Loan & Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,217,000.00
Amount paid in by conveyance of property.....	555,000.00
Entire amount invested in real estate.....	581,067.61
Amount of personal estate.....	292,776.79
Amount of floating debt.....	48,335.96
Amount due company.....	66,962.19

Mineral lands, area circa 2,400 acres, are in a very irregular but fairly compact tract, in Sections 33, 34 and 35, T. 51 N., R. 38 W., and in Section 1, T. 50 N., R. 39 W., bounded on the north by the Union, Adventure and farm lands, on the east by the Adventure, Toltec and Evergreen, on the south by the Flint Steel and the Knowlton mine of the Adventure, and on the west by the Flint Steel, Adventure and St. Mary's Mineral Land Co. Lands include three old mines, the Ridge, Mass and Ogima, also two old prospects, the Merrimac and Hazard, joint production of which, under pre-

vious managements, was 5,565 tons, 1,023 lbs. fine copper. The Ridge mine, operated 1850-1874, made 2,567 tons, 449 lbs. copper, and paid dividends of \$100,000. The old Mass mine, opened 1856 and worked intermittently until 1886, secured a total output of 2,507 tons, 266 lbs. copper, and the Ogima, opened 1860 and closed 1868, made 491 tons, 308 lbs. copper. The Merrimac and Hazard were early-day explorations, without recorded production. These five properties are described, in detail, in Vol. II.

The Mass tract carries six of the seven cupriferous amygdaloids of the Evergreen belt, these varying greatly from point to point, but averaging about 10' width, with a sharp bend in their strike, this varying from N. 32° E., on the north, to N. 37° E. at the southern boundary. The dip of the lodes varies from 38° at the Ridge to 47° at the old Mass mine. The copper-bearing beds of the Mass Consolidated are as follows, from north to south:

- (1.) Knowlton. Carries heavy copper and stamp rock.
- (2.) Mass. Lies 140' south of the Knowlton and carries a little heavy copper and stamp rock.
- (3.) North Butler. Lies about 75' south of the Mass bed, and is wide and fairly mineralized in places.
- (4.) Butler. Lies about 200' south of the North Butler, is 12' to 35' wide, and very bunchy, carrying mainly stamp copper, with occasional masses.
- (5.) Ogima. Lies about 100' south of the Butler. Is mainly a stamp lode, with some barrel-work and occasional masses. Is 10' to 25' wide but shows little good ground.
- (6.) Evergreen or Ridge. Lies about 250' south of the Ogima and is the best lode of the property, ranging 4' to 40' in width, and usually being richest where widest. Is very bunchy, but shows some excellent stopes, yielding heavy copper and stamp rock.

The Mass has openings on all of its copper-bearing beds, and rock is hoisted through the nearest shaft, lodes being connected by crosscuts on various levels. The Mass carries the outcrop of the lodes of the Evergreen belt for about 1½ miles.

"A" shaft, formerly known as the Ridge, has 3 compartments, and is sunk to a depth of 1,600', on the Evergreen lode, and connected with the Butler lode by crosscuts on several levels. The Evergreen lode runs narrower here than in "B" shaft, averaging only 8' to 10' width, but shows much rock of excellent grade. The shafthouse was burned, 1905, and has been replaced by a head-frame. Rock from this shaft goes by gravity-tram, over an 875' trestle, to the rockhouse at "B."

"B" shaft, 875' southwest of "A", is old No. 3 Ridge shaft, cut down to 2-compartment size, and is bottomed at a depth of 1,700'. The levels are of varying depths, owing to the old workings having 60' levels, while some of the newer levels at the bottom are 135' apart. Deep levels permit a considerable saving in drifting through poor ground, and sub-drifts can be run wherever needed. "B" shaft is on the Evergreen lode, upon which the

major portion of the openings have been secured, but the Butler has been reached by crosscuts on numerous levels, and shows some good stopes, and the North Butler is supplying some fair stamp and barrel copper. The Knowlton bed has been opened also, by a crosscut on the 7th level, and shows good stamp-rock and considerable heavy copper. The main reliance, however, is upon the Evergreen, which is a strong amygdaloid, with plainly defined walls and a dip of 43° , showing some good stopes, of 20' and 25' width. The Evergreen, while exceedingly bunchy, and carrying heart-breaking stretches of almost barren ground, shows beautiful stopes occasionally, and the average copper contents, per fathom of ground broken, probably exceed the average of any but the best amygdaloids worked in Houghton county. The shaft-rockhouse at "B" is of wood, iron-sheathed, 48x65' and 80' high, equipped with a steam-hammer, two 22x28" Blake crushers, and a 12x24" Nordberg engine.

"C" shaft, 2,148' southwest of "B", and with collar 100' higher, is 600' deep. It is the old Ogima shaft, cut down, retimbered and deepened, and is sunk on the Butler lode, with crosscuts to the Evergreen bed. Eventually the workings tributary to "C" will be connected, by drifts and crosscuts, with "A" and "B" shafts. The Butler lode makes a fair showing in "C" shaft, and at the end of 1905 this shaft was producing circa 150 tons of stamp-rock daily. The shaft is reached by a railroad spur, and is to have, during 1906, a 40x55' shaft-rockhouse.

"D" shaft is a mere pit, lying circa 800' southwest of "C".

Some diamond drilling was done, during 1905, on the belt of mineral beds paralleling the Evergreen belt and lying circa 2,000' north of the Knowlton lode. This belt includes the Minnesota conglomerate, Calico amygdaloid, and the branch veins associated with these two beds, as opened at the Michigan mine. A shaft has been sunk 130' on the Minnesota conglomerate, and a crosscut is being driven from the bottom to the Calico amygdaloid. This should cut the Branch vein of the Michigan mine, if it carries so far. The copper showing in the Minnesota shaft is considered encouraging.

There are a number of old shafts, the 450' main shaft of the old Mass mine proper having 7 levels, opened on the Knowlton lode. This was pumped out in 1901, and the showing pronounced satisfactory. The Ogima lode has been opened at several points, by crosscuts from "A" and "B" shafts, and was found bunchy, though showing good stopes.

The mine, as a whole, is notably rich in mass copper, and carries considerable silver values, the ground ranging from very rich to absolutely barren. All rock selection is made underground, and culls used for filling. During 1905 the mine made 9,208' of openings, as compared with 3,020' in the preceding year. The number of drills running was increased from 32, at the beginning, to 45 at the close of 1905.

"A" and "B" shafts are operated from a central power-house, 48x150', of wood, iron-sheathed. The hoist is a 24x48" Allis-Chalmers duplex, with 10' drums, having 11' faces, grooved for $1\frac{1}{2}$ " cable, and good for one half-mile depth, operating two six-ton skips in counterbalance, one in each shaft.

There are two 250-h. p. Stirling water-tube boilers, a 50-drill Rand two-stage cross-compound air-compressor, and a 75-kw. dynamo furnishing electric light.

In addition to the usual mine buildings, there are about 60 dwellings, some new, but mostly old buildings thoroughly remodeled. The company also has a townsite, Mass City, which is the terminus of the Mineral Range railroad, and a station on the C. M. & St. P. railway. This town has a number of business houses.

The Mass mill is at Keweenaw Bay, on an arm of Lake Superior, at the junction on the Mineral Range and Duluth, South Shore & Atlantic railways, 16 miles south of Houghton and 34 miles northeast of the mine, with ample sand-room, deep water and immunity from heavy seas. The mill, built by the Wisconsin Bridge & Iron Co., of steel frame on stone foundations, was enlarged, 1905, by a 22' addition, to 90x232'. Equipment includes two Nordberg stamps, having vertical mortar-grates supplied with automatic hydraulic cleaning devices. Each head has a nominal stamping capacity of about 525 tons daily, with actual daily average duty of 480 to 500 tons. It is planned to compound one head, and to install auxiliary crushing-rolls for oversize. A Parnell-Krause atmospheric stamp of small size reduces oversize material from the stamp-mortars. The Mass uses one stamp, and the other is leased to the Michigan mine, but the latter has been notified that the Mass will require both stamps after Sept. 1, 1906.

The 30x60' boiler-house, at the mill, is of wood, with iron sheathing and truss roof, housing two 225-h. p. Stirling water-tube boilers. Ashes and cinders are washed into the lake, through a launder. The 40x70' pump-house has a 16,000,000-gallon Nordberg vertical pump, fed from a 12x30' well, with bottom 6' 6" below mean water-level, connected with a tunnel running 300' under the bed of the bay to the intake. A 1,000' wharf, also serving as a breakwater, has 18' of clear water at its end, equipped with three towers and derricks, capable of unloading coal vessels at the rate of 900 tons daily. Coal is taken from the wharf, in 3-ton cars, by a 14x20' hoist, to a 1,500' trestle of 20,000 tons storage capacity. There also is a 30x40' warehouse, with office in front, a smithy, machine shop and about a dozen dwellings, on a townsite platted by the company, this also having several business buildings.

The Mass began production with inadequate openings. On paper the total feet of openings looked large, but deducting therefrom the unproductive shafts, and about a mile of crosscuts, the total available openings were entirely inadequate, for so buncchy a mine. That the Mass was able to maintain a considerable and fairly steady production, with so little ground opened ahead of actual stoping, speaks well, both for the mine and its management. The operations of 1904 showed a small net profit, but realizing that the mine required greater development, a \$2 assessment was levied. Operations for 1905 entailed expenditures, including the outlay of \$115,460.65 for construction account, of \$394,915.30, and income, from production and interest, was \$334,534.12. The income of \$60,919.47 received from the Mich-

igan, for milling, was deducted from milling costs of the Mass, reducing same to \$19,367.96, giving the Mass a net milling cost of only 13½ cents per ton, for its own rock. Production, 1905, was 2,007,950 lbs. fine copper, of which 885,170 lbs. was heavy copper, secured at the rockhouses, and 1,122,780 lbs. was stamp copper, secured at the mill, giving a return of only 7.83 lbs. fine copper per ton, from rock stamped, rendering the return the lowest ever secured by any mine. Alone, the stamp rock would be hopelessly lean, but the production of heavy copper, taken out at the rockhouses, amounting to 6.17 lbs. per ton of rock treated, brings the total return to exactly 14 lbs. fine copper per ton—a low figure, but higher than that of some other Lake Superior mines. The management plans increasing production to 1,000 tons of rock daily, during the last third of 1906, and the increased tonnage will mean lower costs per ton. The management is doing its best to make a success of a very low grade, bunchy mine, and several years will be required to determine the result beyond question.

MASSEY STATION MINING CO.**ONTARIO.**

Office 43 Exchange Place, New York. Mine office: Massey Station, Algoma, Ont. John W. Thompson, president; Robt. McKay, secretary; Jos. Errington, general manager; R. C. Barclay, clerk and purchasing agent; James Summers, mining captain. Organized 1900, under laws of Ontario, with capitalization \$1,000,000, shares \$100 par. Is closely connected with the Orford Copper Co., which is controlled by the International Nickel Co., and is said to have expended circa \$300,000 on development and equipment. Lands, 640 acres, also 160 acres miscellaneous lands, in Salter township, showing 5 ore bodies, of which two are being developed, these averaging circa 10' width. One vein has been traced for 4,000', and opened to a depth of circa 600', by a shaft having 7 levels, opened 80' apart, with considerable drifting on each level. This shaft develops a vein 9' wide at surface, and 12' at the bottom of the shaft, carrying ore of 3% to 5% copper tenor, with traces of gold and silver, and occasional ore of much higher grade. Vein dips at 85°, and the mine has upwards of 50,000 tons of ore blocked out for stoping.

The ore is a finely disseminated, silicious chalcopyrite, not adapted to wet concentration, owing to excessive sliming, hence a 50-ton experimental oil concentrator, using the Elmore process, has been installed, and is understood to be giving good results. Production is said to be about 100 tons of ore daily, and concentrates are shipped, for smelting, to the Copper Cliff smelter of the Canadian Copper Co., the silicious ore of the Massey being excellently adapted to fluxing the copper-nickel ores of the Sudbury district. Mining plant includes 6½x8" and 10x12" Lidgerwood hoists, and a 6-drill Ingersoll-Sergeant air-compressor. The property is being developed along sound lines, and is of much promise.

MASTODON GOLD & COPPER CO.

Letter returned unclaimed from former office, Spokane, Wash.

MATEHUALA MINING CO.**MEXICO.**

Mine office: Matehuala, San Luis Potosí, Mexico. Is said to have a smel-

ter, blown in March, 1906. Possibly is an erroneous title for *Compafia Metalurgica*.

MAUDEM MINE.**WYOMING.**

Owned by Topeka Copper Co.

GEWERKSCHAFT KUPFERBERGWERK MAXIMILIAN. GERMANY.

Mine office: Nieder-Ludwigsdorf, Schlesien, Germany. Has 2 shafts, the Amalia of 75 metres, and the Aguust of 25 metres. Employed 40 men, at last accounts. Production averages circa 175,000 lbs. fine copper yearly.

MAY DAY MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. J. A. Hunt, superintendent, at last accounts. Is a gold and silver mine, making a little copper as a by-product. Has a steam plant and concentrator.

MAYFLOWER MINING CO.**MICHIGAN.**

Office: 825-60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; preceding officers, John C. Watson, Manning Emery and Stephen R. Dow, directors. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$8 paid in. Annual meeting, third Wednesday in March.

Lands, 840 acres, in Sections 7 and 8, T. 56 N., R. 32 W., also a millsite on Torch Lake. The Kearsarge mine lies to the north, Old Colony to the south and the South Kearsarge and Wolverine mines to the west. Exploratory work was begun in 1899 and ended March, 1906. No. 1, or Faull shaft, is 400' deep, with considerable drifting on the first and second levels, and has a crosscut opening two parallel cupriferous amygdaloids, showing occasional patches of copper, but nothing of promise. No. 2, or Isle Royale shaft, 160' deep, has several hundred feet of drifting and shows a buncy amygdaloid, 10' to 12' wide, carrying more or less copper in a 2' streak next to the hanging wall. No. 3, or Sandstone shaft, is 60' deep, in a soft and badly broken amygdaloid, all of the strata near the Eastern Sandstone being much disturbed. No. 4 shaft, 580' deep, starts from surface on an unnamed amygdaloid lying approximately 2,000' east of the Kearsarge bed, and at a depth of 425' runs into a parallel amygdaloid lying 90' to the eastward of the first bed. The copper showing is poor. A fairly complete geological cross-section has been obtained by drill-borings. Surface improvements include a hoist good for 600', boilers and air-compressor, with necessary buildings. On December 31, 1905, the company had \$11,900 cash on hand, sufficient to pay taxes, and other running expenses of an idle property, for several years.

MAZAPIL COPPER CO., LTD.**MEXICO.**

Offices: 47, Peter St., Manchester, Eng. Works office: Apartado 17, Saltillo, Coahuila, Mexico. Mine offices: Mazapil, Zacatecas, Mexico, and Concepción del Oro, Zac., Mex. William Purcell, managing director; Walter J. Browning, superintendent; T. S. Abbott, engineer. Organized April 21, 1896, (as a reconstruction of company of the same name, organized February, 1891) with capitalization £300,000, shares £10 par; issued, £240,000.

Lands include the San Elijo, Salaberna and other mines, carrying aurifer-

ous and argentiferous copper and lead ores, in 2 groups, at Mazapil and Concepción del Oro. It is planned to drive a long tunnel from Concepción del Oro to the Aranzazu copper mine. Company controls the Ferrocarril Coahuila y Zacatecas, with 78 miles of main line, from Concepción del Oro to Saltillo. The company controls property having 83 different shafts and tunnels. District is arid, and operations are hampered frequently by shortage of water. Company plans building an aerial tram, to connect the mine with a railroad at San Pedro Ocampo.

There is a concentrator and smelter, of 500 tons daily capacity, at Concepción del Oro, but this is antiquated as to equipment. The new reduction plant, at Saltillo, to be finished in 1906, will be complete and thoroughly modern in equipment, being planned to do considerable custom business also, and is well located for such work. The smelter will have electric power, using alternating current generators, direct-connected to 2 Harrison-Fleming Corliss tandem compound condensing air-compressors. Production, 1903, was 6,108,123 lbs. fine copper, and, for 1905, was 6,496,000 lbs. fine copper. Property seems well managed, and bids fair to become one of the important copper producers of Mexico.

MAZE MINE.**JAPAN.**

Mine office: Nishi-Kambara-gori, Echigo, Japan. Opened A. D. 1688. Has several small veins, averaging 12" in width, carrying chalcoppyrite and iron pyrites, frequently associated with sphalerite and galena, lying mainly in propylite. Ore yields 17% to 20% copper, after careful selection. Production, which has decreased of late years, was 110,582 lbs. fine copper in 1900.

McALLISTER & CO.**NEW MEXICO.**

Mine and office: Silver City, Grant Co., N. M. Lucius P. Deming, general manager. Property is the Arizona mine, developed by a 1,200' tunnel, producing auriferous and argentiferous copper ores. Has gasoline and steam power, a 20-stamp mill and a 40-ton concentrator.

McALLISTER MINE.**NEVADA.**

Mine office: Goodsprings, Lincoln Co., Nev. Lands, 16 full and several fractional claims, in the Greenwater district, Funeral Range, Nevada, showing veins of 2' to 40' width, with paystreaks of 12" to 48", carrying cuprite, melaconite and chalcocite, assaying up to 65 % copper, with spar and hematite gangue. District is extremely arid. It is expected that a railroad will reach within 12 miles, during 1906.

McALLISTER-ROWLAND COPPER MINING CO.**WASHINGTON.**

Office: Index, Snohomish Co., Wash. Property is the mine and mill of the Ethel Consolidated Mines Co., held under option.

McCABE EXTENSION MINING & MILLING CO.**ARIZONA.**

Office: Prescott, Ariz. Mine office: McCabe, Yavapai Co., Ariz. Reese M. Ling, president; E. R. McDowell, secretary. Organized July 14, 1900, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Lands, sundry claims, adjoining the McCabe mine, opened by a 300' shaft. Company suffered internal dissensions, during which the original promoters stepped from under. Idle and apparently moribund.

McCABE MINE.**ARIZONA.**

Bought, circa January, 1906, by Ideal Mining and Development Co.

McCOY GROUP.**ARIZONA.**

Office and mine: care of C. E. Taylor, owner, Globe, Gila Co., Ariz.

McKINLEY MINES, LTD.**BRITISH COLUMBIA.**

Office: Grand Forks, B. C. Lands, 4 claims, in Franklin camp, on the North Fork of Kettle river, about 40 miles above Grand Forks. Development, by trenching across an 80' vein of ore, is said to give average assay values of \$8 per ton, in copper, silver and gold.

McKINLEY MINING & SMELTING CO.**NEVADA.**

Lands are the Aurora group. 5 claims, at Ely, White Pine county, Nevada, formerly worked as a gold mine, but carrying copper ores in lower workings. Has a 300' main shaft and about 1,000' of drifts. Was formerly owned by Jas. A. Saxton, father-in-law of President McKinley, on strength of which the company adopted the name. Company was promoted by Hurd & Hearther, 510 Drexel Bldg., Philadelphia, senior partner of which firm is noted for promoting dubious mining propositions. Lands of company were sold at sheriff's sale, December 31, 1904, and bid in by sundry shareholders, who hope to reorganize. Property regarded as of promise, if in competent and honest hands.

McNEELEY & CROWLEY.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Lands, sundry claims, on Pinto Creek, opened by a 170' tunnel, showing disseminated malachite and azurite.

McQUEEN MINE.**MONTANA.**

Owned by Pittsburg & Montana Copper Co.

MEADOW MINING CO.**MICHIGAN.**

Office: 50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. W. F. Fitzgerald, president; John Brooks, secretary and treasurer; Wesley Clark, agent. Organized 1898, under laws of Michigan, with capitalization \$1,500,000, shares \$25 par. Lands, 364 acres, adjoining the Humboldt and Phoenix mines. Has been slightly prospected, but never was a producer. Fully described in Vol. I.

MEADOW MOUNTAIN MINING CO.**COLORADO.**

Offices: Aspen, Colo., and Bangor, Me. Mine office: Crystal, Gunnison Co., Colo. Employs 6 men. F. O. Beal, president; J. T. Stewart, vice-president and general manager; Victor Brett, secretary; J. T. Bowler, treasurer; W. Porter Nelson, assistant secretary and treasurer; preceding officers and C. W. Coffin, directors; John Peters, mine superintendent. Organized under laws of Colorado, with capitalization \$100,000, shares \$1 par. Lands, 8 claims, area 70 acres, also a 5-acre millsite, in the Rock Creek district, showing country rocks of limestone, porphyry and shale, carrying 5 fissure and contact veins, latter between limestone and shale, of which 2, under development, average 5' width and carry chalcopryite giving average assays of 3.5% copper, 4% lead, 23% zinc, 6 oz. silver and \$1 gold per ton. Has shafts of 100' and 300', and an 800' tunnel, with 2,750' of underground openings, showing 1,000 tons of ore blocked out for stoping. Has gasoline power.

MECHAN HERMANOS.**MEXICO.**

Mine office: Viesca, Coahuila, Mex. Property is the Santa Maria copper mine, developed by shaft and tunnels.

MEDICINE BOW'S MINES CO.**WYOMING.**

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. Employs 4 men. G. S. Wright, president; Wm. Benton, vice-president and general manager; S. C. Downey, secretary; J. Welles, treasurer; G. S. Simmons, superintendent; H. H. Houston, engineer. Organized September 19, 1903, under laws of Wyoming, with capitalization \$100,000, shares \$10 par. Lands, 10 claims, area 205 acres, also a 10-acre millsite, showing syenite, granite and limestone, with dioritic traps, veins occurring as fissures in syenite and as contacts between limestone and trap. The Cuprite vein has been reported by company to average 12' to 35' in width. Development is by a 65' shaft and a 960' tunnel, with various pits and 1,500' of underground workings, estimated to show 38,000 tons of ore, with 12,000 tons blocked out for stoping. Vein carries oxidized ores to a depth of 25' to 50' only, with bornite and chalcopyrite below. Shipments have returned 7% to 15% copper, 2 oz. to 12 oz. silver and \$3 to \$18 gold per ton.

MEDINA GOLD MINING CO.**CALIFORNIA & ONTARIO.**

Offices: 504 Bernice Bldg., Tacoma, Wash., and 520 University Blk., Syracuse, N. Y. Mine office: El Dorado, Hastings Co., Ont. Cole Saunders, president; Dr. T. H. Agnes, vice-president; Cole Saunders, Jr., secretary; Hon. Ira A. Town, treasurer; preceding officers L. D. Hill and Geo. Addison, directors. Was paying monthly dividends of $\frac{1}{2}$ cent per share, with occasional extras of same amount, in 1905. Lands include the Kradle, Johnson and Gardner gold mines, opened by tunnels, at Oro Fino, California, and the El Dorado mine, in Ontario, which is said to show a wide vein of copper ore. Company is said to plan installing a smelter at the Ontario property.

MEGORRIS COPPER CO.**ARIZONA.**

Mine office: Silver Bell, Pima Co., Ariz. Mervin Rice, president; W. H. Coe, secretary. Capitalization, \$600,000. Lands, sundry copper claims, in the Old Hat district, said to show good ore. Idle for some years.

MEGUNTICOOK GOLD & COPPER MINING CO.**COLORADO.**

Office and mine: Lake City, Hinsdale Co., Colo. P. G. Dawson, local director. Mine idle for several years, and company's finances much muddled.

GRUBE MEHLBACH.**GERMANY.**

Mine office: Weilmünster, Hessen-Nassau, Germany. Ores carry lead, copper, zinc, silver and gold. Has steam and electric power.

MELBA MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Arizona. R. L. Hamill, superintendent. Property is the Alta mine, carrying ores of silver, lead and copper. Has steam power.

MELCZER MINING CO.**MEXICO.**

Office: 27 William St., New York. Was succeeded by the Copete Mining Co., but is said to have retained direct title to the property, under laws of Mexico, and was said to have been operating the Copete mines, early in 1905.

MELKEDALEN COPPER MINES, LTD.**NORWAY.**

Reorganized, 1904, as Melkedalen, Ltd.

MELKEDALEN, LTD.**NORWAY.**

Offices: 23, Leadenhall St., London, E. C., Eng. Mine office: Evenaes, Ofoten Fjord, Norway. G. B. Mee, chairman; W. A. Stearns, secretary. Organized April 26, 1904, as a reconstruction of Melkedalen Copper Mines, Ltd., with capitalization £125,000, shares 10 s. par; issued, £58,543. Lands, 440 acres, in the Røros district, equipped with a 150-ton concentrator. Presumably idle.

MELROSE COPPER MINE.**AUSTRALIA.**

Office: Stock Exchange, Pitt St., Sydney, N. S. W., Australia. Mine office: Condoblin, Cunningham Co., N. S. W., Australia. H. E. A. Miller, chairman and secretary; G. Eason, treasurer; Malcolm Darrach, superintendent. Organized December 1, 1903, under laws of New South Wales, with capitalization £12,000, shares £500 par. Lands, 4 claims, area 120 acres, held under mineral lease from the crown, also 40 acres carrying water-rights, in the Condoblin district. Property was first known as the Boone West, and later as the Anaconda. Country rocks are metamorphic schist and porphyry, carrying 3 veins. No. 1 vein, opened by a 100' shaft and 160' tunnel, carries 3' of chalcocite and 3' of mixed ore. No. 2 vein, opened by a 300' shaft and 85' tunnel, shows a 6' vein, with a paystreak carrying cuprite and chalcocite, balance of vein carrying circa 4% chalcocopyrite and \$4 gold and silver per long ton, with gangue of altered iron sulphides. No. 3 vein, opened by a 100' shaft, shows 6' of lead and copper ores. Mine has circa 1,400' of openings, estimated to show 50,000 long tons of ore, with 6,000 tons of high-grade ore blocked out for stoping. Company plans building a smelter with one reverberatory furnace and an 80-ton water-jacket blast-furnace. Management is composed of experienced mining men, and property is considered promising.

MEMPHIS COPPER CO.**NEW MEXICO.**

Office: 601 Postal Bldg., Kansas City, Mo. Mine office: Organ, Donna Ana Co., N. M. Employs 10 men. J. I. McCullough, president and general manager; J. R. Bowersox, vice-president; Hill P. Wilson, secretary; F. M. Johnson, treasurer; preceding officers, C. B. Gill, G. F. Sanford, J. T. Wallace and A. M. Peck, directors; Jack Sune, superintendent. Organized June, 1905, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par; issued, \$750,000. Has two shafts, of circa 175' depth each, and shipped from same, during 1905, \$7,965 worth of ore, giving average smelter returns of 17.5% copper and 7 oz. silver per ton.

MEMPHREMAGOG MINING CO.**QUEBEC.**

Mine office: Bolton Centre, Brome Co., Quebec. Property is the old Smith mine, idle for several years.

MENDOCINO COPPER KING MINING CO.**CALIFORNIA.**

Mine office: Yorkville, Mendocino Co., Cal. Idle.

MENDOTA MINE.**MICHIGAN.**

An extensive tract of mineral land, in the northeastern part of Keweenaw

county, Michigan, on which considerable work was done, from time to time, but idle for many years past. Fully described in vol. II.

MENDOTA MINE.**NEVADA.**

Mine office: Bullion, Elko Co., Nev. Ores carry silver, copper and lead.

MENDOZA y CA.**MEXICO.**

Mine office: Barranca del Cobre, Chihuahua, Mex. Produced 195 metric tons of copper, in 1902.

COMPAÑIA MINERA DE ORO y PLATA**MEXICO.****LA MENDOZA, S. A.**

Was the Mexican incorporation of the Arizpe Gold & Copper Co., which died a fraudulent death, circa 1905.

MENLO PARK COPPER MINING CO., LTD.**NEW JERSEY.**

Mine office: Menlo Park, Middlesex Co., New Jersey. Idle.

SOCIEDAD ANONIMA COBRES DE MENORCA.**SPAIN.**

Offices: Gran Via, 32, Bilbao, Spain. Mine office: Mercadal, Mahon, Menorca, Spain. Cirilo de Gana, president; Fernando Olascoaga, vice-president; Manuel de Ozamir, secretary; Esteban Puego, managing director; Baron de Prisbuer, purchasing agent; Don Santiago de Arechago, consulting engineer. Organized October, 1901, under laws of Spain, with capitalization 2,000,000 pesetas, shares 250 pesetas par, 35% paid up. Lands, 411 hectares, including the Rubia, Partida, Emilia and other copper mines, at the base of Mt. Toro, near Mercadal, district of Mahon, Island of Minorca, Spain. Property was undergoing development, with a force of about 60 men, at last accounts.

MERAKER MINES.**NORWAY.**

- Owned by Vignes Kobbervaerks Aktiebolag.

MERCER SYNDICATE.**ARIZONA.**

Mine office: care of W. H. Mercer, P. O. Box 56, Globe. Gila Co., Ariz. Lands, sundry claims, in vicinity of the Five Points property, on which a shaft is being sunk.

MERISKEI WORKS.**RUSSIA.**

Office: care of R. A. Richner, Batum, Russia. Mines are near Tiflis, Kutais, Russia. Production, 1899, was 164,092 lbs. fine copper.

MERRIMAC COPPER CO.**COLORADO.**

Organized 1888, under laws of West Virginia. Claimed to have property at Taylor, Colorado, which is not a post-office. Charter forfeited. W. & J. MERRY MINING CO.

CHILE.

Mine office: La Serena, Coquimbo, Chile. Santiago Merry, general manager. Has steam power and a smelter.

MESA MINING & REDUCTION CO.**ARIZONA.**

Office and mine: Mesa, Maricopa Co., Ariz. Organized 1904, with capitalization \$2,000,000. Idle.

MESCALERO MINING & MILLING CO.**NEW MEXICO.**

Mine office: Roswell, Chaves Co., N. M. J. A. Ryan, president; J. A. Cottingham, secretary; John S. Lenox, manager; James E. Hunt, superintendent; John Kinnie, mill superintendent. Mine, developed by a 400' tunnel,

carries auriferous and argentiferous copper ores. Has steam and electric power, 20-stamp mill, concentrator, 100-ton cyanide plant and 50-ton smelter.
MESCAL MINING & MILLING CO. **ARIZONA.**

Letter returned unclaimed from former mine office, Providence, Arizona.

COMPANIA METALURGICA.

MEXICO.

Mine office: Matehuala, San Luis Potosí, Mexico. H. N. Nichols, president; E. Harms, superintendent. Plant includes concentrating and smelting works with two lead furnaces and 3 copper furnaces, having a daily capacity of 1,000 tons. Does a strictly custom business and employs circa 1,000 men.

METHOW GOLD & COPPER MINING CO.

WASHINGTON.

Office: 77 Jamieson Blk., Spokane, Wash. Mine office: Winthrop, Okanogan Co., Wash. W. D. Scott, president; J. N. Tewinkel, secretary and treasurer. Organized under laws of Washington, with capitalization \$90,000, shares 5 cents par. Lands, 8 claims, area 150 acres, showing fissure veins in metamorphosed conglomerates of Huronian age, carrying sulphide ores assaying 9% copper, 2 oz. silver and \$5.50 gold per ton, developed by a 52' shaft and three tunnels, longest 465'. Has available water power and timber. Presumably idle.

METROPOLITAN MINING CO.

WASHINGTON.

Mine office: Berlin, King Co., Wash. Ores carry gold, silver and copper. Has water power. Presumably idle.

COMPANIA METALURGICA MEXICANA.

MEXICO.

Office: 82 Beaver St., New York. Mine offices: Sierra Mojada, Coahuila, Mex., and Concepción del Oro, Zacatecas, Mex. Employs circa 1,500 men. Works office: San Luis Potosí, S. L. P., Mex. Robt. S. Towne, president and treasurer; Geo. Foster Peabody, first vice-president; A. Foster Higgins, second vice-president; Chas. J. Nourse, Jr., secretary and assistant treasurer; D. C. Brown, general manager; Geo. H. Carnahan, superintendent; C. M. Van Cleve, smelter superintendent; Frank W. Carnahan, engineer; James Ganett, mine superintendent at Sierra Mojada; Ludwig Heldt, mine superintendent at Concepción del Oro.

Organized 1890, under laws of New Jersey, with capitalization \$4,000,000, shares \$100 par, in \$1,000,000 cumulative 8% preferred, \$1,250,000 guaranteed 6% second preferred, and \$1,750,000 common stock. Bonds, \$2,000,000, at 5%; sinking fund, 2% per annum of outstanding bond issue. Annual meeting, first Monday in June. Morton Trust Co., New York, registrar. Is said to have discontinued dividends, temporarily, during 1905, owing to heavy outlay for mines, smelters, railroad and other enterprises.

Property interests are extensive, including control of numerous subsidiary mining, transportation and land companies, among the more important being the Sombrerete Mining Co. and the Mexican Lead Co., at Sombrerete, Zacatecas, Mexico, and the Montezuma Lead Company, Alvarez Lead & Timber Co., Mexican Mineral Railway Co. and Potosí & Rio Verde Railway Co. Among the properties owned outright are the Veta Rica mine, at Sierra Mojada, producing argentiferous lead and copper ores, averaging 3% copper, 5% zinc and 20 oz. silver per ton. This property is opened by a 600' main shaft, and is a

very important lead producer. The Cerro Prieto and adjoining mines, at Concepción del Oro, are opened by tunnels, producing auriferous copper ores, employing circa 100 men. The San Pedro and San Pablo mines also are important producers, and the company owns extensive tracts of timber lands.

The smelter, at San Luis Potosí, is of circa 700 tons daily capacity, and has a modern equipment throughout, including roasting furnaces, lead and copper stacks, and a briquetting plant. The works have steam and electric power and employ circa 1,000 men. This is an important mining company, and a very considerable producer of lead and silver, copper being made mainly as a by-product.

MEXICAN-ARIZONA MINING CO.

ARIZONA.

Absorbed, 1903, by New England & Clifton Copper Mines of Arizona.

MEXICAN COPPER CO.

ARIZONA.

Letter returned unclaimed from former mine office, Martínez, Arizona.

MEXICAN COPPER CO.

MEXICO.

Mine office: Salinas, San Luis Potosí, Mex. R. B. Watson, manager, at last accounts. Has steam and gasoline power and a small smelter. Presumably idle.

MEXICAN COPPER SYNDICATE, LTD.

Offices: St. George's House, Eastcheap, London, E. C., Eng. J. Peters, chairman; G. Mountier, secretary. Capitalization, £15,000; issued, £1,700. Location of property, if any, not learned. Apparently moribund.

MEXICAN INVESTMENT & DEVELOPMENT CO.

MEXICO.

Office: Guanajuato, Gto., Mexico. Lands include the Auga Blanca mine, area 40 pertenencias, located 30 miles northwest of Autlán. This property, opened circa 1860, by John and Edward Blake, was the leading copper producer of Mexico, for two decades. The mine has a 700' tunnel, developing a vein of 12' to 80' width, carrying chalcopryrite, of 4% to 5% tenor, devoid of both gold and silver. The reduction plant includes crushers, rolls, jigs and Wilfley tables, and miscellaneous improvements, including a sawmill, smelter, iron foundry, and iron rolling-mill, which were completed, under great disadvantages, and operated successfully, by the Blakes. The mine is opened to shallow depth only, but, given a modern equipment, should make a good property.

MEXICAN MINERALS CO., LTD.

MEXICO.

Offices: 28, Budge Row, London, E. C., Eng. Letter returned unclaimed from former mine office, Zimapán, Hidalgo, Mexico. S. Crowder, managing director; Hedley D. Crowder, mine manager, at last accounts. Capitalization, £36,000; issued, £31,507; debentures, £10,000. Lands, 300 pertenencias, area circa 750 acres, including the Montezuma mine, carrying ores of copper, gold and silver. Mine is developed open-cast and has water and electric power. Idle and company moribund.

MEXICAN MINING SYNDICATE.

MEXICO.

Letters returned unclaimed from alleged office, New York, and alleged mine office, Acuitzio, Michoacán, Mexico. Organized July 22, 1905, under laws of Maine, with capitalization \$1,000,000, shares 10c. par, to succeed La

Natividad Mining Co., which was barred from the mails, as a fraud, by the United States postal authorities.

MEXICAN UNION MINING CO.

MEXICO.

Office: 753 Monadnock Bldg., Chicago, Ills. Mine office: Unión de Tula, Jalisco, Mexico. Newton B. Storer, president; Chas. G. Thompson, secretary; Wm. H. Lees, general manager; B. W. Sweet, mill superintendent and engineer. Organized April, 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 100 pertenencias, area 247 acres, in the Ayutla district showing a 30' fissure vein, with laterals, in limestone, opened by a 275' shaft, showing chalcopryite giving assays of 7% copper, 10 oz. to 50 oz. silver and from a trace to \$10 gold per ton. Has a 75-h. p. steam plant and has contracted for the development of a water power. The 35-ton concentrator has a 7x9" Dodge crusher, 1 train of rolls, one 5' Huntington mill and 3 Overstrom tables.

MINA MEXICO.

MEXICO.

Mine office: Sabinal, Chihuahua, Mexico. Uriatta Hermanos, owners. Ores carry silver, copper and lead. Has steam power.

MEXICO CONSOLIDATED MINING & SMELTING CO.

MEXICO.

Office: 60 State St., Boston, Mass. Mine office: Guanaceví, Durango Mexico. J. A. Coram, president; John T. Judd, vice-president; Larkin T. Trull, second vice-president; W. J. Freeman, secretary; Stephen M. Crosby, treasurer; preceding officers, W. S. McCornick, L. R. Rogers, Geo. Himmighoffen, Geo. C. Beckman, S. L. Rosenstamm, Spencer W. Richardson and E. L. White, directors; F. C. Morehouse, general manager. Organized July, 1904, under laws of Maine, with capitalization \$2,500,000, shares \$10 par; issued, \$2,400,000. First National Bank of Boston, registrar; Federal Trust Co., Boston, transfer agent. Annual meeting, third Wednesday in June. Officers of company are closely identified with the Bingham Consolidated Mining & Smelting Co. In addition to the property in Durango, company is said to have lands in the San Pedro district of Chihuahua, Mexico, showing considerable ore bodies carrying good average values in copper, silver and gold, predominant values being in silver.

MEXICOLA GOLD-COPPER MINING CO.

COLORADO.

Letter returned unclaimed from former office, Cripple Creek, Colo. M. J. Maynard, president; T. J. Hines, secretary. Organized under laws of South Dakota, with capitalization \$200,000. Lands, 3 gold claims, north of Rhyolite Mountain, and 9 copper claims, area 78 acres, in the Little Badger district, near Howard, Fremont county, Colorado.

MIAMI COPPER CO.

ARIZONA.

Letter returned unclaimed from alleged mine office, Globe, Gila Co., Ariz. Organized 1905, with capitalization \$500,000, shares \$1 par.

MICHIGAN & ARIZONA DEVELOPMENT CO.

ARIZONA.

Office: care of Little & Prindle, Guaranty Loan Bldg., Minneapolis, Minn. This company reopened the Helvetia mine, and reorganized the Helvetia Copper Co., under a plan of promotion explained in Volume V. Is inactive, property consisting solely of a considerable share interest in the Helvetia Copper Co.

MICHIGAN-ARIZONA MINING CO.**ARIZONA.**

Office: 17 First St., Muskegon, Mich. Mine office: Mammoth, Pinal Co., Ariz. Employs 4 men. S. H. Hamilton, president and general manager; James Hamilton, vice-president; Theo. P. Swift, secretary, treasurer and engineer. Organized August 22, 1904, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Lands, 7 claims, area 140 acres, in the Bunker Hill district, showing a country rock of granite, ore occurring in fissure veins and also as impregnations in the country rock, and, at times, in brecciated masses of country rock, with porphyritic intrusions. Has a 50' shaft and tunnels of 93' and 150', showing cuprite, melaconite, malachite, chalcocite and a little chrysocolla, giving average assays of 29.2% copper, 5 oz. silver and \$1.20 gold per ton. Is 22 miles from the Santa Fé, Prescott & Phoenix railroad, which is expected to reach within 8 miles, and a spur can be built to the mine if necessary. Company plans continuing development, and may build a small concentrator.

MICHIGAN BOY MINING & MILLING CO.**WYOMING.**

Office: care of Dr. C. W. Long, superintendent, Denver, Colo. Lands, supposedly are in the Encampment district of Wyoming. Idle.

MICHIGAN-COLORADO MINING & MILLING CO.**COLORADO.**

Office: Colon, Mich. Mine office: Florissant, El Paso Co., Colo. W. H. Wagner, president; J. W. Bryant, vice-president; Dr. A. J. Kiser, secretary; A. C. Himebaugh, treasurer; John M. Kellogg, general manager. Organized December 10, 1902, under laws of Michigan, with capitalization \$500,000, shares, \$25 par. Annual meeting, first Tuesday in December. Lands, 14 claims area 280 acres, also a 5-acre millsite and sundry water rights. Succeeded to properties of Colorado Springs Copper Mining & Tunnel Co., and Blue Mountain Copper Mining Co., circa January, 1906. Has some development, by tunnel, and plans continuing same and adding steam power and a 4-drill Sullivan air-compressor.

MICHIGAN COPPER & GOLD MINING CO.**UTAH.**

Office: 404 West Third South St., Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Michael H. Osborne, president; L. C. Johnson, secretary. Organized December, 1902, under laws of Utah, with capitalization \$300,000, shares \$1 par. Lands, 4 claims, area 80 acres, known as the New York group, in the San Francisco district, near the Horn Silver mine, opened by a 40' shaft. Idle, but able to levy assessments.

MICHIGAN COPPER MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Rockland, Ontonagon Co., Mich. Employs 280 men. Jos. E. Gay, president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; preceding officers, Jos. W. Howe and Alfred M. Low, directors; Samuel Brady, superintendent; S. Howard Brady, assistant superintendent; Chas. R. Forbes, engineer; Henry Stubensky, clerk; S. S. Jennison, master mechanic. Organized Jan. 5, 1899, under laws of Michigan, with capitalization \$2,500,000, shares, \$25 par; \$17 paid in. Last assessment, \$1 per share, was levied December, 1903. Annual meeting,

first Tuesday in May. American Loan & Trust Co., Boston, transfer agent; Old Colony Trust Co., Boston, registrar.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,600,000.00
Amount paid in by conveyance of property.....	670,350.00
Entire amount invested in real estate.....	734,550.46
Amount of personal estate.....	141,154.84
Amount of floating debt	33,134.45

Lands, 4,870 acres of mineral territory, 1,466 acres of timber and miscellaneous lands, and a 150-acre millsite, giving total holdings of 6,686 acres, mineral lands being in Sections 1, 2, 3, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26, and 27, Town 50 North, Range 30 West. The main tract is 3 miles east and west by $4\frac{1}{2}$ miles north and south, in addition to which there are four scattering tracts to the westward, one of 40, two of 80 and one of 160 acres, all carrying the outcrop of the Calico amygdaloid. The Michigan lands include the old Minnesota, Rockland and Superior mines. The Superior made 283 tons, 1,331 lbs. fine copper, 1856-1869 and 1876-79. The Rockland, lying next east of the Minnesota, was operated 1853-1870 and made 3,105 tons, 309 lbs. fine copper, from the Minnesota contact vein, which averaged about 2' width and carried considerable silver, in that mine. The old Minnesota mine, opened 1847, closed 1870, made 17,352 tons, 668 lbs. fine copper, and paid dividends of \$1,820,000.

The Minnesota, or Minesota, as it was then spelled, was discovered by a line of prehistoric pits, in one of which was a 6-ton mass of copper, raised 0.1 skids, on top of which grew a hemlock tree having nearly 400 rings of annual growth. Immense masses of virgin copper were taken from the Minnesota, the largest, found 1856, measuring 12'6"x18'6"x46', weighing 527 short tons, and requiring the work of 20 men for 15 months in cutting it into pieces small enough for hoisting. The Minnesota was opened on a contact vein, having a gangue of quartz, epidote and calcite, with an amygdaloid hanging and conglomerate footwall, both of which were impregnated with copper near the contact. Miners called the Minnesota a conglomerate mine, because more copper was found in the footwall than in the denser amygdaloid hanging-wall. The richest ground occurred near the "counter vein," a transverse fissure. The Minnesota had a 40-ton mill, with gravity stamps, but the production was mainly from masses, and the smaller pieces of native metal called barrel-work. In 1870 the old Minnesota company met low prices for copper, a pinching of the vein, and the necessity for more powerful hoists, simultaneously, and gave up the struggle. The openings above the adit level, being free from water, were worked by tributors, for years afterwards, and yielded hundreds of tons of mass and barrel copper, affording evidence that a large amount of heavy copper must remain in the lower stopes, then inaccessible to tributors, because filled with water, and these also should yield considerable stamp rock, left unmined in the days when nothing under 3% rock paid for milling.

The Minnesota had 10 shafts, deepest circa 1,100'. Four central shafts

were sunk from surface on the North Minnesota fissure, which joined the contact vein at about 300' depth. The Michigan mine is a combination of two entirely new mines and a reopened old mine, its shafts being sunk on the Calico amygdaloid, a bed outcropping 140' north of the Minnesota contact vein, and a few feet north of the North Minnesota fissure. In addition to the Calico lode, Minnesota contact, North contact and Branch vein, all more or less developed by the present workings, the Michigan tract carries the Knowlton, Mass, Ogima and South Amygdaloid beds, also an unnamed amygdaloid farther south, these latter belonging to the Evergreen belt, worked a few miles to the northeastward by the Mass and Adventure mines. The Knowlton, or northernmost of the Evergreen series of parallel lodes, lies circa 1,000' south of the old Minnesota shafts, and a 7' amygdaloid, supposed to be the Butler, opened to some extent in Peninsula Bluff, 2,000' south of "B" shaft, shows heavy copper and stamp rock. There are three old shafts on the Butler lode, also an adit cutting several parallel cupriferous beds. There also are copper-bearing amygdaloid outcrops north of the Calico bed, on which no work has been done.

The Calico parallels the contact vein, and the old Minnesota mine has been reopened by crosscuts, simultaneously with the development of a new mine on the Calico itself, which has been opened for nearly a half mile, and the making of a second new parallel mine on the Branch vein. The country rock is a melaphyr trap, and the Calico amygdaloid ranges from almost a trap to nearly a conglomerate, carrying considerable felsite, with occasional patches of sandstone, and large quantities of epidote, prehnite and calcite. The strike is approximately N. 68° E., with a dip of about 46° 30' and a width of 5' to 25', with about 9' average width. Most of the copper occurs in a 2' to 3' pay-streak near the footwall, though occasional good patches occur in the center, and on the hanging-wall. The copper carries a little silver and is mostly in nodules, called shot-copper, with a little barrel-work and occasional small masses, the heavy copper occurring mainly near the intersections of numerous cross-fissures filled with clay gouge. The lode is strong, standing well without timber, and is sinuous both as to strike and dip, with very irregular walls, the amygdaloid bed merging into the trap footwall by almost imperceptible degrees. There also is a tendency to split, the "footwall vein" being rich in such cases, but leaving the main bed very lean in copper. There also is a "hanging-wall vein," and branch veins, in addition to which the Minnesota contact and North Minnesota fissure are found within 140' distance of the Calico. In fact, the entire section between the Calico and the Minnesota contacts, and for a little distance on either side, comes very near being a sort of magnified stockwerk, where copper may occur at almost any point, even where least expected. None of the old shafts are in commission, and the new mine is opened by 3 shafts, all sunk on the Calico bed.

"A", the westernmost shaft, lies about 1,000', on the strike of the lode, from the boundary line of the National mine. This is 7x18' inside of timbers, has 3 compartments, and is 1,781' in depth, not having been deepened during 1905. The lode runs as wide as 18' in places and shows some excellent ground. Stopping is in progress on numerous levels. A crosscut was sent on the 14th level to

the contact vein of the old Minnesota, which averages 4' width at that point, and carries rich copper for a distance of circa 150', then grows leaner.

"B" shaft, with 2 compartments, lies 985' east of "A" and also is 1,781' in depth. The lode runs 20' to 25' wide in places and the lower levels show some good stopes on the Calico. This shaft has a Burnham sinking pump, with capacity to fork 400 gallons per minute from a quarter-mile depth. The "Branch Vein" is opened from this shaft, this ore body lying between the Calico and the Minnesota contact, closely underlying the former on the fifth level but receding therefrom steadily, until it touches the contact vein, just above the thirteenth level, but rolls away therefrom at greater depth. The "Branch Vein" is narrow, but very rich, showing many masses of tons in weight, a 20-ton mass having been found in 1905, this being the largest mass of copper secured in any Lake Superior mine for some years. The "Branch Vein" has been opened from the fifth to fourteenth levels by crosscuts. The eastern drifts of the "Branch Vein" are making the best showing. The old Minnesota mine was unwatered from "B" shaft by diamond drill holes, bored across at each successive level. The old workings were found in very bad shape, after three decades of neglect, and the contact vein is reached by crosscuts on the eleventh and thirteenth levels, below the bottom of the old workings, showing a vein of about 20' width, with 6' to 7' on the hanging wall carrying copper in good quantities.

"C" shaft lies 1,353' northeast of "B" and was 350' deep at the end of 1905. The formation is more settled than to the westward, and the showing on the Calico bed is better than was secured at similar depth by the two other shafts, but "C" shaft was idle, for several years, until April, 1906. Adjoining "C" shaft is an old shaft sunk on the Minnesota contact vein, with a depth of circa 675', and having its collar 90' below the collar of "C" shaft. The old workings are being unwatered by diamond drill holes, bored on successive levels, on the same plan as was followed in unwatering the old mine workings from "B" shaft. The "Branch Vein" of the Michigan is thought to be identical with the "North Vein" formerly worked in the Rockland mine, now a part of the Michigan mine and tributary to "C" shaft.

There is room on the main tract of the Michigan for an additional shaft west of "A", and, if developments warrant, the extent of the company's mineral lands is such that a considerable number of new shafts could be opened eventually on the various cupriferous beds carried on the Michigan lands. The mine has circa 7 miles of new openings, and operates about 30 power drills.

The "Branch Vein" is furnishing about half the copper now made by the mine, although it is supplying but one-third of the rock tonnage, that is, the Branch is about twice as rich as the Calico, the former yielding about 32 lbs. refined copper per ton as compared with 16 lbs. from the latter. Daily rock production is about 480 tons, of which approximately 160 tons is from the Branch and 320 tons from the Calico. Production is about one-third heavy copper and two-thirds stamp copper. The width of the Branch is 2' to 8', with an average of 4', but as the vein dips at approximately 58°, ample head-room is allowed for working, without beating away worthless rock. The Branch carries mainly

mass and barrel copper, with considerable stamp rock. The showing throughout the openings in the Branch is almost uniformly good, and it affords stoping ground from end to end of every opening. The showing of heavy copper is the best now made by any Lake Superior mine, and the average of 480 lbs. per fathom, or 32 lbs. fine copper per ton, puts the Branch ahead of the Champion and Wolverine mines, and second only to the Calumet & Hecla among Lake Superior copper producers. The "Branch Vein" has been opened for a quarter mile laterally, and has been traced for two miles. Openings on the Branch are being secured about twice as fast as ground is stoped, which means that ground is being opened at the rate of about 325 tons daily, which rate can be increased, a little later. The mass copper found throughout the "Branch Vein," is in pieces weighing from a few hundred pounds up to 20 tons each, and two men, using pneumatic chisels, are employed steadily, in cutting these masses into pieces suitable for hoisting.

The engine-house, 50x115', stands midway between shafts "A" and "B". The "A" section has a 24x60" Webster, Camp & Lane double-cone straight-face hoist, with a 7' drum having a 15' face, carrying 4,000' of cable and capable of raising 4-ton skips in counterbalance at 3,500' per minute from a depth of 3,500'. The hoisting cable passes around solidly anchored sheaves, giving a straight pull at each shaft. The "B" hoist, installed 1905-1906, is a 24x60" Allis-Chalmers duplex-cylinder straight-face hoist, operating 2 drums in balance, or separately, also good for 3,500' depth. The temporary hoist, formerly used for "B" shaft, is to be used at "C", this being a 13x16" hoist with 6' drums. The boiler-house, between the two sections of the engine-house, has four 165-h. p. Burt locomotive firebox boilers, with room for a fifth, also a 1,000-h. p. Cochran feed-water-heater and purifier. The power-plant includes a 40-drill Ingersoll-Sergeant two-stage air-compressor. A 12-drill Norwalk air-compressor and a 10-drill Ingersoll-Sergeant air-compressor, displaced by the new compressor, have been installed in the basement of the engine-house, as auxiliaries.

The shaft-rockhouses at "A" and "B" are duplicates, each having 800-ton storage-bins and each being equipped with a 50-h. p. Nordberg engine, two 18x24" crushers, one 13x20" crusher, and a steam-hammer for mass and barrel work.

The machine shop is 30x60', and other mine buildings include a stone smithy, carpenter shop, warehouse, office building, and a 22x50' model changing house. Water is secured from the old Minnesota dam, the mine and location having mains and hydrants, with a Knowles pump in the basement of the power-house capable of raising a 5" stream against a 400' head, and an auxiliary Deane pump, 200' distant, capable of raising a 5" stream against a head of 425'. There are acetylene gas plants in the power-house and in each rockhouse, and a 250' coal-trestle, with inclined tunnel and tramway underneath, leading to the boiler-house. All buildings are connected by a private telephone system, and the mine is served by the Mineral Range railroad.

Stamping was begun November 12, 1903, with a leased head, at the Mass mill. Notice has been given that this must be surrendered September 1, 1906, when it will be required by the owner. It will be necessary for the Michigan to

secure custom milling for nearly another year and arrangements have been made to have rock stamped at the Atlantic mill. Work was started, April, 1906, on the new mill of the Michigan, adjoining the Mass mill, at Keweenaw Bay, Lake Superior. This will have two heads, but the exact type has not been fully determined as yet, and probably will go into commission during the latter half of 1907. The Michigan owns some dressing machinery, including a 5-stamp gravity battery and 10 Overstrom tables, in the Mass mill, which will be removed to the new mill.

Production, 1905, was 2,891,796 lbs. fine copper, a small gain over the previous year. Income, exclusively from production, was \$453,683.37, and ordinary expenditures were \$407,767.21, leaving a mining profit of \$45,916.16, against which were construction expenses and land purchases aggregating \$50,686.92, leaving a net decrease of \$4,770.76 in assets by the year's operations. The company ended 1906 with a balance of assets of \$103,249.63, and doubtless will levy an assessment, probably of \$1 or \$2 per share, for the cost of the new mill, which probably will be about \$150,000. Production, January, 1906, was 196 tons of mineral, this being the largest in the history of the mine, and greater than ever was secured in one month by the old Minnesota mine, which, in its day, was the greatest copper mine in the Lake Superior district, and one of the greatest dividend-paying mines of the United States. In the early months of 1906 the mine was making net mining profits estimated at about \$10,000 per month, and, with the aid of the new hoist at "B" shaft, and with a small tonnage from "C", should be able to produce circa 1,000 tons of stamp-rock daily by the time the new mill goes into commission. With the practical doubling of production, which is assured, the Michigan will take an important place among the copper producers of the Lake Superior district, and should earn profits that will enable the mine to join the ranks of the dividend-payers, circa 1909. The management, both general and local, is all that could be desired, and is as good as is enjoyed by any copper mine—which is high praise, but fully deserved.

MICHIGAN-MEXICAN MINING CO.

MEXICO.

Dead.

MICHIGAN MINING CO.

WYOMING.

Office: care of D. W. Gill, Cheyenne, Wyo. Moribund.

**MICHIGAN & MONTANA COPPER MINING
& SMELTING CO.**

MONTANA.

Office: Kalispell, Mont. Mine office: Altyn, Teton Co., Mont. J. M. Harris, manager. Lands, sundry claims, some distance from rail transportation, giving fair assay values from auriferous and argentiferous copper ores. Is said to have a 100-ton concentrator. Presumably idle.

MICHIGAN-NEW MEXICO COPPER CO.

NEW MEXICO.

Office: Grand Rapids, Mich. Mine office: Lordsburg, Grant Co., N. M. J. L. Hamilton, president; C. R. Luton, secretary and general manager; Wm. H. Stevens, superintendent. Lands, 4 claims, area 80 acres, known as the Dakota-Pearl mine, in the Burro Mountains, circa 15 miles from the Santa Rita mines. Ores give assays up to about 8.5% copper, \$3 silver and \$4 gold

per ton. Has a 280' shaft, and at last accounts planned installing a 50-ton leaching and cyanide plant, and a smelter. Presumably idle.

MICHIGAN SMELTING CO.**MICHIGAN.**

Office: 27 State St., Boston, Mass. Works office: Houghton, Houghton Co., Mich. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; Frederick I. Cairns, general manager; preceding officers, John R. Stanton and Chas. H. Paine, directors; Frank Klepetko, consulting engineer. Organized 1903, under laws of Michigan with capitalization \$500,000, shares \$25 par.

Property is a reduction plant, located circa 3 miles west of Houghton, near the old Atlantic stamp-mill, with frontage on Portage Lake. It was designed by Frank Klepetko and is the largest and most modern smelter in the Lake Superior district, with capacity of 90,000,000 lbs. fine copper yearly, built to smelt the mineral of the Stanton and Copper Range groups, including the Mohawk, Wolverine, Atlantic, Baltic, Trimountain, Champion, Winona and Michigan mines.

The plant is terraced throughout, permitting economical and largely automatic handling of material. The terraces for the different structures are sand-graded, with stone retaining walls. Mineral is delivered to the works in 40-ton bottom-dumping steel cars, by the Copper Range railroad, which also hauls away the refined copper, for shipment from the Copper Range wharves, in Houghton. The 3,000-ton mineral storage bins, holding ten days' supply for the works, are located on the upper terrace. Mineral is dehydrated in rotary dryers, by waste gases from the furnaces, taken to the furnaces in tram-cars and dumped into hoppers on the charging floor. Coal-trestles, on an upper plateau, hold 15,000 tons of hard and soft coal, with separate storage compartments for charcoal, sand and limestone. Tunnels under the coal-trestle lead to the boiler-rooms and furnaces, fuel being delivered in tram-cars, loaded cars descending by gravity.

The reverberatory furnace building, of steel and brick, with truss roof, is 160x205' in size, and has 5 furnaces, with room for a sixth. Two furnaces are 16x36' each, two are 14x23' each and one is 15x18', while a sixth, to be built as a spare, is to be 16x40', and of 100 tons daily capacity. The two larger furnaces were built 18x50', over all, but gave so much trouble that they were cut down 14' in length.

Alternating with the larger reverberatories are one 300-h. p. and two 200-h. p. Stirling water-tube boilers, heated by waste gases from the furnaces. After leaving the boilers the waste gases are drawn through a 6x8' subterranean flue, with arched roof, up the hill to a 150' smokestack with base 100' above the furnace building. The reverberatory building has two 5-ton electric traveling cranes.

From the reverberatories the molten copper goes to two blast furnaces, on a lower level, north of the reverberatories, where blister copper is cast mechanically, in moulds, upon a circular table, cooled in water and carried by a link elevator to the loading platform. The cupola building is 40x70', of steel and brick, with two floors. Slags are carried mechanically to the

sampling mill, and reduced in a 30-ton crusher of 1,000 tons daily capacity, for resmelting. The waste slags from the final fusion are granulated by jets of water, and discharged through launders, to low ground northward, for grading.

The combination machine-shop and power-house, of steel and brick, has a complete equipment of shop tools, driven by an independent engine, and a 300-h. p. Nordberg horizontal tandem-compound engine driving a 200-kw. generator actuating the rotary blowers for the blast furnaces. Electric power is used extensively, for operating the drying plant, casting machinery and electric cranes, and also for lighting purposes, and actuates three specially designed Jeffrey electric locomotives, of 100-ton draw-bar pull, taking current from overhead trolleys and hauling 8 pressed steel Sheffield mineral and coal cars, tracks reaching practically every part of the plant.

Miscellaneous buildings include a combination two-story and basement office and laboratory, of brick, heated by exhaust steam, also a 40x60' iron-sheathed frame warehouse, barn, etc. The plant has two 50' track-scales, of 150 tons capacity each, one for mineral and one for coal and flux, with smaller scales at other points. Water is obtained from the old Atlantic dam, on Cole's creek, through a 4,300' flume, with capacity of 5,000 gallons per minute, leading to a 50,000-gallon water-storage tank, located 100' above the works, giving good pressure at all points.

The works are treating the mineral of six mines, each of which is smelted separately, and are turning out circa 5,500,000 lbs. of refined copper monthly. The sixth reverberatory will give a monthly capacity of 10,000,000 lbs. fine copper, providing for growth of the mines for some years to come. In August, 1905, these works broke a world's record for casting from a single furnace, by turning out a charge containing 292,000 lbs. fine copper in 7 hours, or at the rate of 750 lbs. per minute. This work was done by a crew of ten men, of whom 5 attended the furnace, and one operated the casting machine, while 4 men were required to inspect, sort and load the ingots in cars.

In its earlier stages the Michigan smelter was severely criticised, much of the criticism being unfair, and nearly all of it uncalled for. The minor defects inseparable from a large plant embodying the most advanced methods and machinery, have been eliminated, and the plant is working smoothly and economically, accomplishing the results for which it was planned, and is a credit to its designer and management.

MICHIZONA DEVELOPMENT CO.

ARIZONA.

Option surrendered and company wound up, 1905.

MICHOACÁN RAILWAY & MINING CO., LTD.

MEXICO.

Offices: 2, Suffolk Lane, Cannon St., London, E. C., Eng. Mine office: Angangué, Michoacán, Mexico. T. Adams, secretary; Jas. W. Malcolmson, consulting engineer. Organized Jan. 29, 1889, with capitalization £105,364, shares £1 par, in £21,015 "A" cumulative 7% preference shares, £12,190 "B" non-cumulative 7% preference shares, £70,745 ordinary shares and £1,414 founders' shares: issued, £99,370. Debentures, £27,090, in a 4% prior lien, and £103,000 in 4% mortgage bonds. Railway rights originally

held have been disposed of, remaining property being sundry mines and mineral lands, now leased to the Compañía Metalúrgica de Angangueo.

MICHUACÁN SAN FRANCISCO COPPER MINES

MEXICO.

SYNDICATE, LTD.

Voluntarily liquidated, March, 1902.

JOSÉ MICULICICH.

PERÚ.

Office and mine: San Tadeo, Yauli, Junin, Peru. Was a small producer of argentiferous copper ore, at last accounts.

MIDDLEMARCH COPPER CO.

ARIZONA.

Office: 212 Henne Bldg., Los Angeles, Cal. Mine office: Middlemarch, Cochise Co., Ariz. H. Bert Ellis, president; M. M. O'Gorman, vice-president and general manager; preceding officers, Rufus L. Horton, Richard Gird and Wm. King Gird, directors; Broadway Bank & Trust Co., Los Angeles, treasurer; M. E. Anderson, mine superintendent. Organized April 26, 1897, under laws of California, with capitalization \$1,000,000, increased, March 28, 1906, to \$3,000,000, shares \$100 par. Of the new stock, \$1,000,000 is to be given the Cobreloma Copper Co. for its property, and \$1,000,000 placed in the treasury for development purposes, including the building of a smelter. An authorized bond issue of \$200,000 has been annulled. Annual meeting, first Monday in April.

Lands, 68 claims, area 1,400 acres, in the Middlemarch division of the Dragoon district, Dragoon Mountains, showing 6 parallel contact veins, between limestone and granite-porphry, having a general strike of NW. and SE., with, an average dip of 42° to 54° to the southwest. Two of these ore bodies, under development, range 30' to 80' in extreme width, showing the usual oxidized ores above, with sulphides below, chalcopyrite being the predominant ore of the base zone. Ores carry an average of 4% to 5% copper, from nothing to 10% zinc, 2 oz. silver and 60 cents gold per ton. Development is by shafts of 210', 160', 100', 165', 110' and 305', also by tunnels of 285', 193', 425' and 625', with about two miles of underground workings, estimated by company to show 200,000 tons of ore, with 100,000 tons blocked out for stoping, practically all in the Missouri mine. The ores of the Missouri at depth are base, and are deficient in lime and iron, not being sufficiently pyritic to concentrate well. On the advice of an expert, called in for consultation, milling is in abeyance, and efforts will be made to develop suitable smelting ore at depth, instead of erecting a 300-ton concentrator, as had been planned. It is probable that a 4-compartment shaft will be sunk on the Missouri mine, and the Cobreloma tunnel, which reached the main ore body early in 1906, will be continued.

Equipment includes a 300-h. p. steam plant. The power-house, 30x38', is of stone and iron, and the boiler-house, of wood, is 32x38'. The concentrator, of wood, is equipped with one 8x12" Blake crusher, 2 trains of rolls, 2 Bartlett tables, 1 slime table and 3 sizers. The smelter, 30x40' and 3 stories high, is of wood and concrete, connected with the mine by tramway. Smelter capacity is 40 to 60 tons daily, plant having a blast-furnace that makes matte of 55% to 70% in copper tenor, with variable gold and silver values, when in blast. Nearest railroad, 8 miles, is the Arizona & Colorado. Mining costs average about \$2 per ton and smelting costs about \$5 per ton. Ore was free smelting at

surface, but became refractory at depth, through deficiency in lime and iron, hence the smelter was closed until large bodies of sulphide ore can be opened at depth. Management is considered honest, and the property is regarded as valuable.

MIDLAND GOLD & COPPER MINING & REDUCTION CO. UTAH.

Office and mine: care of Albert Swingewood, secretary and treasurer, Hot Springs, Box Elder Co., Utah. Geo. B. Dean, president; F. J. Hirt, vice-president; Daniel Convery, manager. Organized 1904, with capitalization \$1,000,000, shares \$1 par. Lands, 14 claims, 2 miles from Hot Springs, in the Sierra Madre district.

MID MOONTA COPPER MINES, LTD. AUSTRALIA.

Reconstructed, Oct. 29, 1901, as Moonta Central Copper Co., Ltd.

MIDNIGHT MINE. ARIZONA.

Office and mine: care of St. Charles Bros., owners, Chloride, Mohave Co, Ariz. Presumably idle.

MIEDNOROUDIANSK MINE. RUSSIA.

Mine office: Bogoslovsk, Nijni Tagilsk, Perm, Russia. Is an old and famous copper producer, notable for a great variety of copper minerals, including oxides, carbonates, silicates and phosphates, with occasional native copper, and especially notable for large pieces of massive malachite, one mass of 330 tons having been found in 1836. Was operating in a small way, at last accounts.

MILFORD COPPER MINING & SMELTING CO. UTAH.

Office: 5 Walker Bank Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Geo. H. Dern, president; Chas. E. Hudson, secretary and treasurer; Frank H. Lathrap, general manager. Organized 1902, under laws of Utah, with capitalization \$300,000, shares \$1 par. Lands, 11 claims, area 220 acres, lying near the O. K. mine of the Majestic company. Presumably idle.

MILFORD GOLD & COPPER MINING CO. UTAH.

Mine office: Milford, Beaver Co., Utah. Idle.

CHAS. S. MILLS & CO. MEXICO.

Office and mine: Sierra de Oro, via Horcasitas, Ures, Sonora, Mex. Chas. S. Mills, general manager. Lands, 103 hectareas, known as La Colorada group, also a 6-hectarea millsite, in the Ures district, showing 5 veins, ranging 2' to 100' in width, occurring as fissures in porphyry and as contacts between porphyry and phonolite, carrying gold, silver, copper, nickel, cobalt and platinum. Mine is opened by a 100' shaft and a 440' tunnel, and is equipped with steam power and a small stamp-mill and concentrator of about 20 tons daily capacity. Nearest railroad is the Sonora branch of the Southern Pacific, 25 miles distant. Employs 25 men, normally, but idle since 1905, owing to the Yaqui Indian uprising.

MILTON COPPER CO. MICHIGAN.

Wound up, December, 1902, and property sold for \$468.40.

MILTON MINE. MICHIGAN.

Office: care of Byron N. White, owner, Spokane, Wash. Lands, 890

acres, between the Norwich and Victoria mines, Ontonagon county, Michigan. Has been slightly prospected, but never was a producer.

MILWAUKEE MINING CO.**MONTANA.**

Letter returned unclaimed from alleged mine office, Butte, Silver Bow Co., Montana. Is said to have 6 claims in Butte, including the Florence and Stonewall, and 6 claims in the Argenta district of Montana.

MILWAUKEE-MONTANA NATURAL BRIDGE**MONTANA.****GOLD & COPPER MINING CO.**

Office: 127 Third St., Milwaukee, Wis. Letters returned from alleged mine office, Contact, Park Co., Montana. Was promoted by C. T. McElroy, who enjoys a poor reputation.

MILWAUKEE-PALMER MOUNTAIN GOLD &**WASHINGTON.****COPPER MINING CO.**

Letter returned unclaimed from former office, 23 Metropolitan Block, Milwaukee, Wis.

SOCIEDAD DE MINAS y FUNDICIÓN.**CHILE.**

Mine office: Carrizal Alto, Freirina, Atacama, Chile. Operates the Portozuelo, Armonia and 12 other mines. The Armonia, about 1,200' in depth, was a considerable producer, for some years.

MINDOULI MINE.**FRENCH CONGO.**

Mine office: Comba, via Brazzaville, French Congo State. Is a slightly developed prospect, never a producer.

MINE DEVELOPMENT ASSOCIATION.**NEW MEXICO.**

Mine office: Socorro, Socorro Co., N. M. W. H. Bullard, president; H. A. True, secretary; Cony T. Brown, manager. Ores carry values in copper, lead, zinc and silver. Has steam power.

MINERAL CREEK COPPER CO.**ARIZONA.**

Letters returned unclaimed from former mine office, Globe, Gila Co., Ariz.

MINERAL CREEK MINING CO.**ARIZONA.**

Dead. Had copper lands in Pinal county, Arizona, circa 1881.

MINERAL CREEK MINING & SMELTING CO.**WASHINGTON.**

Office: 515 California Bldg., Tacoma, Wash. Mine office: Mineral, Lewis Co., Wash. Adrian F. Kirkpatrick, president; Chas. H. Little, secretary; Harold Howes, superintendent. Organized June 14, 1901, under laws of Washington, with capitalization \$2,000,000. Ores carry gold, silver, lead and copper. Has water power and a 20-ton smelter. Presumably idle.

MINERAL HILL CONSOLIDATED COPPER CO.**ARIZONA.**

Office: 331 Fourth Ave., Pittsburg, Pa. Mine office: Tucson, Pima Co., Ariz. Employs 25 men. M. S. Isherwood, president; Boon Ingells, vice-president; C. B. Reeser, secretary, treasurer and superintendent; E. N. Ray, general manager; T. E. Jones, mine superintendent. Organized March, 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par, as successor of the Azurite Copper & Gold Mining Co.

Lands, 26 claims, 12 patented, area 520 acres, in the San Xavier district, 18 miles southwest of Tucson, including the Azurite group of 13 claims,

which produced \$550,000 worth of ore, also the American group of 8 claims, and the Mineral Hill group of 5 claims. The various properties of the company are developed by 74 pits and open-cuts, 48 shafts, mostly shallow, 5 deepest being 130', 125', 150', 345' and 200', and by 8 tunnels, mostly short, longest being 250', with a total of 6,000' of underground openings, claimed to show 45,000 tons of ore, averaging 10.2% copper and \$3 per ton in combined gold and silver values. Main shaft, 345' deep, March 15, 1906, is to be sunk to 500', and crosscuts driven from that depth. Has a 150-h. p. steam plant, with hoists good for 350' and 2,000'. Property has an antiquated smelter, with a 30-ton water-jacket blast-furnace. Mine is said to show a large body of sulphide concentrating ore, averaging circa 3.5% copper, and is considered a promising property.

MINERAL HILL COPPER & GOLD MINING CO.

ARIZONA.

Apparently succeeded, March, 1904, by Mineral Hill Consolidated Copper Co.

MINERAL HILL COPPER SYNDICATE, LTD.

ARIZONA.

Controlled by Argyle Mining Co., Ltd.

MINERAL HILL MINING CO.

WASHINGTON.

Office: 49 West 125th St., New York. Mine office: Conconully, Okanogan Co., Wash. Samuel Lloyd, president; A. R. Lacey, secretary; E. P. Wheeler, superintendent. Has cupriferous silver-lead ores, developed by tunnel. Has steam power and crusher, and plans developing an available water power of circa 4,000 h. p. Idle.

MINERAL HILL MINING & SMELTING CO.

CALIFORNIA.

Office: 237 Twelfth St., San Francisco, Cal. Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, manager. Lands, 5 claims, on which considerable development has been secured by a 535' tunnel. Ores carry gold and copper. Has water power.

MINERAL MINING CO.

OREGON.

Mine office: Huntington. Baker Co., Ore. H. C. Stratton and A. J. Crook, managers. Has steam power and a small smelter. Presumably idle.

MINERAL MINING & SMELTING CO.

NEVADA.

Office: Reno, Nev. Mine office: Palisade, Eureka Co., Nev. Lands, sundry claims, on Mineral Hill, midway between Eureka and Palisade, said to show a 16' vein, carrying auriferous and argentiferous copper and lead ores, giving assays up to \$1,108 per ton in gold. In March, 1906, company was said to be building a 60-ton smelter, at Palisade.

MINERAL MOUNTAIN MINING CO.

ARIZONA.

Dead. Had lands in the Santa Rita Mountains, Arizona.

MINERAL MOUNTAIN MINING CO., LTD.

NEW MEXICO.

Mine office: Stein's Pass, Grant Co., N. M. Chester W. Maxson, superintendent. Ores carry silver, lead and copper. Has steam power. Idle.

MINERAL POINT MINING CO.

COLORADO.

Mine office: Marble, Gunnison Co., Colo. L. Hoffman, superintendent, at last accounts. Lands include the Carbonate group, carrying cupriferous gold and silver ores. Has gasoline power and a 50-ton smelter.

MINERS COPPER CO.

Merged, March, 1899, in Isle Royale Copper Co.

MICHIGAN.**MINES DEVELOPMENT CO.****NEVADA.**

Mine office: Lovelock, Humboldt Co., Nev. John T. Reid, president; Pat Reid, vice-president; E. E. Reid, secretary; preceding officers, R. C. Moore, J. Thies, Peter Ancker, E. B. Loring and John O'Kane, directors. Organized 1905, with capitalization \$700,000, shares \$1 par. Lands, 23 claims, in vicinity of Black Horse, White Pine county, circa 30 miles east of Ely and 30 miles west of Lovelock, said to show a mineralized formation 300' wide, carrying copper ores giving assay values up to \$50 per ton. Company also owns 925 acres of placer gold ground, near Osceola, White Pine county, Nevada.

MINGINEW COPPER SYNDICATE, LTD.**AUSTRALIA.**

Offices: 216, Mansion House Chambers, London, E. C., Eng. Mine office: Mingenew, Western Australia. C. Mullen, secretary. Capitalization, £5,000. Held copper property on lease. Moribund.

MINGUS MOUNTAIN COPPER CO., LTD.**ARIZONA.**

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. R. A. Thomas, president; Thos. E. Metcalf, vice-president; W. W. Thomas, second vice-president; J. R. Thomas, secretary and treasurer; A. M. McDermott, assistant secretary; preceding officers, W. B. Simmons and W. B. Metcalf, directors; Thomas Brothers & Metcalf, managers. Organized March, 1900, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par; issued, \$2,350,000. Lands, 38 claims, area 750 acres, in process of patenting, in the Black Hills district; showing 3 fissure veins, carrying oxide and sulphide ores, developed by shafts of 370', 120' and 250', with several tunnels, giving total openings of 3,670', on an ore body having an extreme width of 40' and traceable 4,000'. The property gives a good surface showing of slightly auriferous copper carbonates, assaying up to 16% copper. Company estimates average value of ores at 8% copper, with small gold and silver values. Has a 50-h. p. steam plant, with 2 hoists, good for 1,000', and several mine buildings. Is 10 miles from nearest railroad, and lands are fairly well timbered and watered. Company plans continuous development. Management seems good, and property is considered promising.

MINING EXPLORATION CO., LTD.**ARGENTINA.**

Offices: 19, New Union St., London, E. C., Eng. Col. Sir T. Hungerford Holdich, chairman; Wm. Rich, consulting engineer; F. Lumely, general manager; F. A. Bagnall, secretary. Organized Dec. 29, 1900, with capitalization £175,000, shares £1 par; issued, £173,500. Property includes prospecting rights and 2 copper mines, La Victoria and Las Charcas, in Argentina, circa 60 miles from Tinguiririca, Chile, which is the nearest rail point. Management estimates 100,000 tons of ore in sight that will average 8% copper and 5 oz. silver per long ton. It is planned to issue £105,000 in new capital, and from proceeds erect a reduction plant, with mill and smelter capable of treating 30,000 tons of ore yearly. Property and management are well regarded.

MINNEAPOLIS COPPER MINING & MILLING CO.**WYOMING & MONTANA.**

Letters returned unclaimed from former office, Minneapolis, and from former mine offices, Boulder, Mont., and Encampment, Wyo.

MINNEHAHA COPPER-GOLD MINING CO.**WASHINGTON.**

Office: 30 Court St., Boston, Mass. Mine office. Danville, Ferry Co., Wash. Ernest C. Wood, consulting engineer; S. L. Boyer, superintendent. Organized under laws of Maine, with capitalization \$50,000, shares \$1 par. Lands, 4 claims, area circa 70 acres, opened by several shallow shafts, deepest 250', and a 206' tunnel, with a new tunnel started, planned to be 1,124' long. Mine shows a vein giving assays of \$14 to \$60 in gold and copper, with a 12" paystreak assaying \$40 per ton. Made first shipment of ore Dec. 15, 1903, to Granby smelter, and made shipments, during 1904, giving net returns of \$250 to \$400 per car. Property is regarded as promising.

MINNEHAHA MINE.**MONTANA.**

Office and mine: care of Dodge & Kilburn, owners and operators, Basin, Jefferson Co., Mont. Mine, 2 miles from Basin, is opened by a 200' tunnel, showing two narrow veins, with paystreaks of 8" giving 18% copper, and 8" showing 13% copper, 13 oz. silver and \$2 gold per ton. Shipped a little ore in 1904. Presumably idle.

MINNESOTA MINE.**MICHIGAN.**

Company wound up. Mine now owned by Michigan Copper Mining Co.

MINNIE GULCH MINING & TUNNEL CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Ores carry gold, silver and copper. Has steam power. Presumably idle.

MINNIE HEALY MINING CO.**MONTANA.**

Property sold, 1906, to Butte Coalition Mining Co.

MINNIE MABEL GOLD & COPPER MINING CO.**WYOMING.**

Letters returned unclaimed from former mine office, Rambler, Wyo.

MINONG MINE.**MICHIGAN.**

The most important copper property on Isle Royale, Michigan. Has several shafts, deepest 300'. Opened 1874, closed 1879, after making 249 tons, 650 lbs. fine copper. Described in Vol. II.

MINONG RANGE COPPER CO.**WISCONSIN.**

Succeeded, 1906, by Rudolph Land Co. Described in Vol. III.

MINOVACA MINE.**WASHINGTON.**

Mine office: care of Wells & Evans, owners, Bossburg, Stevens Co., Wash. Ores carry gold and copper. Presumably idle.

MINT GROUP.**WASHINGTON.**

Office: care of D. F. Strobeck, owner, Spokane, Wash. Lands, on Gold Hill, near Myers Falls, Washington, show 3 veins, of 8' to 25' width, giving assays of 8% copper, 5 oz. silver and \$8 gold per ton.

N. MIRANDA y CA.**CHILE.**

Office and mines: Freirina, Atacama, Chile.

MISKWABIK DEVELOPMENT ASSOCIATION, LTD.**MICHIGAN.**

Office: Lake Linden, Mich. Mine office: Phoenix, Keweenaw Co., Mich.

Hon. Charles Smith, president; Alfred A. Guck, secretary; Joseph Bosch, treasurer; James Chynoweth, superintendent. Organized February 28, 1903, under laws of Michigan, with capitalization \$35,000, shares \$1 par. Lands, 1,224 acres, in 5-57-31, 32-58-31 and 33-58-31. Exploration was begun June, 1903, and an amygdaloidal bed, identified as the Kearsarge lode, was located circa 4 miles northeast of No. 1 shaft of the Mohawk mine, the northernmost mine opening on the Kearsarge bed. Several shallow shafts were sunk, showing copper in variable quantities, but lacking persistent values. Main shaft is 170', showing no copper in the bottom. This lode may not prove the Kearsarge, which possibly lies a quarter mile to the southeast. Diamond drill borings did not prove encouraging, and funds becoming exhausted, the property was closed down, late in 1905.

MINA MISMA MATRACAL.**MEXICO.**

Office and mine: Indé, Durango, Mex. Reinaldo E. Avila, owner and manager. Ores carry copper and silver. Has steam power

MISSOULA COPPER MINING CO.**MONTANA.**

Office: Mullan, Idaho. R. R. McCormick, president; Henry Billings secretary. Development is by a 1,000' tunnel. Presumably idle.

MISSOURI COPPER CO.**MISSOURI.**

Letter returned unclaimed from former office, 50 State St., Boston.

MISSOURI COPPER MOUNTAIN MINING CO.**MISSOURI.**

Letter returned unclaimed from former office, 632 Century Bldg., St. Louis, Mo. Mine office: Sullivan, Crawford Co., Mo. L. M. Barnard, president; W. H. H. Myers, secretary; M. P. Welton, superintendent. Capitalization \$1,000,000, shares \$100 par. Lands, 74 acres, freehold, 690 acres leasehold and options on 7,428 acres adjoining, in Crawford, Franklin and Washington counties, Missouri. Mine was worked in a small way, before the middle of the Nineteenth Century. Development is by 4 shafts, and by tunnels of 240' and 1,000', showing carbonate ores, with hematite gangue and heavy clay gouge, said to average about 10% copper. Has steam power and concentrator with a Blake crusher, 18" and 22" rolls, 4 New Century jigs, Card concentrating table and hydraulic classifiers. Smelter has a 40-ton Allis-Chalmers water-jacket furnace, with Root blower. Country rock is magnesian limestone, ore body having a good gossan capping, with vein showing chalcoppyrite and iron pyrites in the sulphide zone. Presumably idle.

MISSOURI & MEXICAN MINING CO.**MEXICO.**

Office: Dwight Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mexico. Geo. A. Wittig, president; Leo N. Leslie, secretary. Lands, 370 acres, near Todos Santos, on the Yaqui river, 9 miles northwest of Suaqui de Batuc, and circa 100 miles from a railroad, said to show ore carrying values of \$60 to \$300 per ton. Management is undetermined whether to ship ore to a custom smelter, or to build a reduction plant at Suaqui de Batuc. Operations presumably hampered by the uprising of the Yaqui Indians.

MITCHELL DEVELOPEMENT CO.**ARIZONA.**

Liquidated, 1906. Fully described in Vols. IV and V.

MITCHELL MINING CO.**MEXICO.**

Office: 52 Wall St., New York. Mine office: La Dicha, Guerrero, Mexico. Geo. Mitchell, president; Thomas H. Anderson, vice-president; Wm. F. Fluhrer, treasurer; preceding officers, Samuel V. Woodward, Martin F. Morris, B. F. Cole, Robert E. Morrison, Geo. W. Burleigh and Philip S. Dyer, directors; J. McD. Mellen, secretary; F. E. Beecher, assistant secretary; E. D. Elson, general manager; E. E. Noon, mine superintendent; Geo. D. Case, smelter superintendent; Geo. Ross, master mechanic.

Organized April 16, 1902, under laws of Arizona, with capitalization, \$5,000,000, shares \$10 par; issued, \$4,636,000. Direct title to the mines is held through La Dicha Mining & Smelting Co., S. A., organized under laws of Mexico. The Mitchell Mining Co. controls La Dicha & Pacific Railroad Co., which has an issue of \$1,000,000 bonds, at 6%, underwritten by large shareholders of the Mitchell, and guaranteed, both principal and interest, by the Mitchell Mining Co. Knickerbocker Trust Co., New York, registrar. Annual meeting, first Monday in April. Further reference to company's finances will be found at the end of this article.

Mining lands, 1,800 pertenencias, area 4,446 acres, include La Dicha, Mitchell, McKinley, Edward VII, Hensey, Odell and Last Chance groups, giving holdings of a solid parallelogram of one by seven miles, with the axis of the tract along the strike of the vein. These lands are in the districts of Bravos and Tavares, State of Guerrero, circa 40 miles in an air-line from Acapulco, one of the best ports on the Pacific. In addition to mineral holdings, there are about 18,000 acres of plantation lands and 164,000 acres of virgin timber lands, latter carrying medium and high-grade woods, including some good oak, yellow pine, and hardwoods, assuring an abundant supply of timber for mining, building and commercial purposes. All lands are owned in fee. The district is fertile and healthy, with an excellent climate, the temperature averaging 74° Fahrenheit. El Rincon ranch, area 18,000 acres, has 8,000 coffee trees, 16,000 cacao trees, pineapples, oranges etc., and also grows corn and other cereals and vegetables, beside grazing large herds of cattle and flocks of sheep, the ranch furnishing all food supplies for the workmen employed at the mines.

The principal mining property is La Dicha group, lying circa 2,000' above sea-level, comprising various locations, on a continuous vein of sulphide ore upwards of 5 miles in length, continuity being proven by a heavy gossan capping, and also a series of mountain streams that have croscut the vein down to the sulphide zone, at intervals of a quarter to a half mile, the width of this ore body varying from 150' to 225'. Country rocks are granite-porphry, limestone, schists and quartzite, the ore body having a granite footwall and schistose hanging. This ore body has been exposed to a depth of 745' at one point, by a stream cutting through, and is estimated, by Mr. Mitchell, to contain at least 9,000,000 tons of 4% self-fluxing sulphide ore. In addition to this copper vein, the company has upon its extensive landed holdings promising bodies of coal and iron ore, also veins carrying gold and silver. Below the gossan, and above the chalcopyrite that forms the great bulk of the ore

in La Dicha vein, is a layer of 1' to 6' of chalcocite, ranging from slightly disseminated to massive, and assaying 50% to 74% in copper tenor. Tunnel No. 2 shows about 12,000 tons of this extremely rich ore. The vein-matter is essentially pyrrhotite, pyrite and chalcopyrite, forming a self-fluxing ore, requiring no concentration.

The development of the mine has been aided greatly by nature, in cross-cutting the vein at numerous points. The Rio Alcaparosa parallels a considerable portion of the vein, receiving as affluents numerous smaller streams that have cut across the vein at approximately right angles. These streams have worn down their beds, sometimes for hundreds of feet, affording perfect cross-sections of the ore body.

Development is mainly by tunnels, which will afford cheap extraction for some time to come. The mine has 8 shafts and 14 tunnels, with a total of about 14,000' of openings, all of the shafts and tunnels being in ore. The principal developments are between shaft No. 1 and tunnel No. 8, a distance of about 2,800', in which are about 3,000' of shafts, tunnels, crosscuts and winzes, estimated to expose 4,500,000 tons of ore. Shafts are of the following depths; No. 1, 500'; No. 2, 105'; No. 3, 300'; No. 4, 105'; No. 5, 130'; No. 6, 305'. Tunnels are of the following lengths: No. 1, 65'; No. 2, 151'; No. 3, 130'; No. 4, 253'; No. 5, 74'; No. 6, 690'; No. 7, 338'; No. 8, 470'; No. 9, 640'; No. 10, 85'; No. 11, 356'; No. 12, 308'. Tunnels Nos. 4, 6, 8, and 9 have tram-tracks. All shafts are of full 2-compartment size, solidly timbered and equipped with temporary wooden shaft-houses, iron-sheathed. The mine was very carefully sampled, 1905, in 10' sections, average assays by sections running 2.25% to 8% in copper tenor, with an average of 4%. President Mitchell states to shareholders that the ores of the mine will average 6% copper. In August, 1904, the company claimed to have 861,975 tons of ore blocked out for stoping, with 6,898,636 tons in sight. Owing to mine being opened by tunnels, no heavy mining plant is required. The power plant includes two 40-h. p. and two 120-h. p. hoists, two Rand air-compressors and 12 power drills. The company has a general store and a village of dwellings, small but comfortable, for its workmen. The supply of native labor is ample, and the workmen are fairly efficient, wages ranging from 29 cents to 42 cents gold, per day, for natives.

About 3 miles from the southern end of the mine is the Rio Papagalla, giving an available head of 200', if reached by a tunnel of about 1,000' length, which would develop about 8,000 h. p. in the dry season. There also is a smaller water-power available, on the Rio Alcaparosa, for which a 350-h. p. plant is said to have been ordered, for the operation of hoists, power drills, sawmill, ice-plant and electric lighting. It has been estimated that these two streams could be made to develop about 20,000 h. p., or twice the estimated power required for mining and railroad use.

The smelter-site, at a 75' waterfall, is ample to accommodate a very large reduction plant. The smelter has a 200-ton Mitchell economic hot-blast furnace, and a 300-ton blast-furnace of the same make was being installed in March, 1906. Blast is furnished by 3 Root blowers. The converter plant, of 25 tons daily capacity, has one stand and 3 shells, turning out blister copper of

99% tenor, carrying gold and silver values not stated by company. Wood and charcoal are used for fuel, as well as coke.

La Dicha & Pacific Railroad, controlled by the Mitchell Mining Co., will be 83 miles long, running from the mines, near Chilpancingo, to Puerto Marquez, 3 to 10 miles south of Acapulco. The surveys were completed, and contracts for grading and laying steel were let, early in 1906. Steam will be the motive power, at the start, and the road will be of narrow gauge, but it is planned to widen the gauge and electrify the line, eventually. In addition to handling the Mitchell company's business, the road will secure an extensive and profitable traffic from the sugar haciendas, ranches and timber tracts along its line. The Mexican government has granted exemption from import duties on rails, bridge material, rolling stock and equipment of every nature, for the railroad, and has granted similar exemption on machinery required by the mine.

Production for 1905 is not given, which is a mistake, but is estimated by the Copper Handbook at 3,000,000 lbs., which may be too high. The company was reported to be making 15 tons of 65% matte, equal to nearly 10 tons fine copper, late in 1905, but these figures lack verification.

A 5% dividend was declared December, 1905, but apparently this was a promised dividend only, payable in bi-monthly installments of 1%, the first installment of 1% being paid January 10, 1906, and apparently the second installment was paid in March, 1906, but in May the dividend was passed, the reason given being the cost of enlarging the plant, etc. The Copper Handbook can but repeat its criticism of one year ago, and emphasize its previous statement, that the Mitchell is not yet on a basis where dividends can be paid, without injury to the standing and material welfare of the company. The Mitchell is a big, low-grade property, that will cost millions of dollars to develop and equip to a point commensurate with its size. The high-grade ores can be run through a small smelter, and made to pay small dividends, but such a policy is a seriously mistaken one, and will result disastrously, beyond question. Mr. Mitchell is an experienced mining man, and an even more experienced smelter man, but whatever profit the mine may be able to earn on its present limited production should be put back in the mine—every dollar of it—and in all likelihood more with it, for at least two years to come.

MITSU BISHI GOSHI-KWAISHA.

JAPAN.

Office: Mitsu Bishi Bldg., Yaesucho Itchome, Kojimachi-ku, Tokio, Japan. Mine offices: as given in detailed mine descriptions following: K. Nambu, president; S. Harada, vice-president; S. Sho, secretary; R. Tayakawa, treasurer; A. Yamada, general manager. Company is an extensive producer of copper, its principal mines being the Yoshioka, Arakawa, Makamine, Osaruzawa, ranking in importance in about the order given, also the Omodani, Ikuno, Sado and other smaller mines.

The Yoshioka mine, at Fukiya-mura, Kawadami-gori, Bitchu, M. Fujioka, general superintendent, has water and electric power, with a 50-ton smelter, and employs circa 1,000 men. This mine was very difficult of access, until a new road was built, by the present owners. The mine, opened circa 1806, has been worked continuously since that time, but never was a large producer, until

taken by the present owners, in 1873. Ore is chalcopyrite, associated with iron pyrites, pyrrhotite and sphalerite, with quartz gangue, and averages 9% copper after dressing. Ore occurs in veins, in country rocks of clayslate, sandstone and schalkstein, traversed by porphyry dykes. Production, 1900, was 1,722,000 momme silver and 1,081,346 lbs. fine copper, and is considerably larger at present, the mine having developed well, during the past 5 years.

The Arakawa and Hisanichi mines, M. Ooye, general superintendent, are at Akawa-mura, Senhoku-gori, Ugo. The Arakawa, formerly known as the Ugaiwa mine, was reopened 1871, and after passing through various hands, was bought by the present owners, in 1896. Country rocks are of Tertiary and Quaternary ages, including hornblende-andesite, liparite and propylite, numerous parallel veins being found in the propylite, with strike approximately north-east and southwest. Production, 1900, was 566,268 lbs. fine copper.

The Hisanichi mine, near the Arakawa, shows 6 principal veins, the largest known as the Ugaisawa, averaging about 24' width, with one-third pay ore, but occasionally branching into several small veins. The other workable veins range 5' to 7' in width. Ore is chiefly argentiferous chalcopyrite, associated with iron pyrites, and frequently carrying native copper, cuprite, chrysocolla, sphalerite and galena, with a quartz gangue. The property has water and electric power and a 50-ton smelter, employing circa 1,200 men. Production, 1900, was 1,734,522 lbs. fine copper.

The Makamine mine, at Kitakata-mura, Higashi-Usuki-gori, Hyuga, was idle for many years, until reopened, circa 1896, by the Mitsu Bishi company. The ore is chalcopyrite, associated with iron pyrites, averaging 3.5% to 4% iron copper tenor. The property has been modernized in equipment and methods, and production, 1900, was 1,208,282 lbs. fine copper.

The Osaruzawa mines are at Hanawa, Kazuno, Rikuchu, Japan. K. Ishihara, superintendent; K. Okamoto, smelter superintendent; W. Matsuhashi, mine superintendent; K. Ikeda, mill superintendent; T. Kawamura, engineer. These are very ancient mines, opened in the Eighth Century, but were worked for gold only, until circa A. D. 1650, when copper ores were developed. Lands, circa 1,000 acres, also 200 acres miscellaneous lands, in the Kazuno district. Ore is mainly chalcopyrite, with occasional bornite and a little native copper, associated with iron pyrites and small quantities of hematite, sphalerite and galena. Native gold is found also, mixed with the copper ores, and in a quartz fahlband, gold values occurring mainly in the upper workings. Veins are very numerous, ranging from 5" to 30' in width, with an average of perhaps 3'. The veins are very persistent in strike, and hold workable to an average depth of circa 500', traversing Tertiary shales and tuffs, with intrusive augite-andesite and liparite. The Osaruzawa mines are opened by 8 working shafts, deepest 470', and 7 main tunnels, longest 7,500', and have upwards of 15 miles of underground workings. The smelter has two 40-ton water-jacket blast-furnaces and a 250-h. p. electric plant, turning out blister copper 99.09% fine. The Osaruzawa mines employ circa 1,000 men, and, in the 1,200 years of operation, have produced immense quantities

of gold, silver and copper. Production, 1902, was 2,448,000 lbs. fine copper, with considerable gold and silver values.

The Ikuno mines, at Ikuno, Tajima, under the general superintendence of T. Hori, employ circa 1,000 men and have steam, electric and water power. These valuable mines were discovered A. D. 807, and in the period 1596-1620, were extensively worked, under the management of the Tokugawa government, being taken over by the Imperial government in 1868, and sold to the present owners in 1896. The three principal mines of this group are the Tasei, Kanagase and Kasei. The Tasei mine has a principal vein averaging 14' in width, with numerous branches, traversing liparite, propylite and Tertiary tuffs, carrying argentite, native gold and silver, chalcopyrite, malachite, sphalerite, galena and iron pyrites. The Kanagase mine, nearby, has the same country rocks as the Tasei, but is traversed by basalt dykes, a great fault-seam 30' to 40' in width, filled with brecciated country rock, showing 6 veins carrying native copper, bornite, chalcopyrite, tetrahedrite, argentite, stibnite, sphalerite, pyrrargyrite and galena. The Kasei mine has a country rock of diorite, traversed by liparite and propylite dykes, metalliferous veins occurring in the diorite, and carrying chalcopyrite and native silver, with ores of antimony, lead, zinc and silver. Production, 1900, was 984,355 lbs. fine copper, 1,280,932 momme silver and 29,620 momme gold.

The Omodani mine, at Kami-Ahama-mura, Ono-gori, Echigo, is an ancient property, opened A. D. 1350. The mine has numerous small veins, none exceeding 4' width, carrying bornite, chalcopyrite, sphalerite and galena, all argentiferous and showing occasional native silver. Production, 1900, was 614,438 lbs. fine copper and 103,682 momme fine silver.

The Sawatari mine, at Kitakata-mura, Higashi-gori, Hyuga, adjoins the Hibira mine. Ore occurs, as small lenses, in paleozoic clayslate and sandstone, and production, 1900, was 137,191 lbs. fine copper.

The Sado mines, at Arakawa-cho, Island of Sado, are 425 miles from Tokio, and have Y. Uriu as general superintendent. The property was owned by the Mikado, and operated as a sort of government mining school, until 1898, when bought by the Mitsu Bishi company. The mines have auriferous and argentiferous copper ores, being essentially gold producers, and are equipped with steam, water and electric power, and an exceptionally good plant of modern mining machinery. Production 1905, by all mines, was 12,727,944 lbs. fine copper.

The Mitsu Bishi Goshi-Kwaisha is one of the four large copper mining companies operating in Japan, and shares with the others the honor of being exceptionally progressive and successful. The success has not been won by the possession of mines of altogether exceptional value, although the company has some excellent properties, but rather has been secured by development along modern lines, with the aid of the best technical skill, and the most modern methods and appliances, in mining and metallurgy. Brains, experience and courage make successful copper mines, in Japan, just as they do in every other country where employed.

MITSUI & CO.**JAPAN.**

Mine office: Funatsu, Yoshiki-gori, Hida, Japan. Bichru Matsuda and C. Tanikawa, superintendents. The Kamioka mine is essentially a silver-lead producer, making a little copper as a by-product. Ores are principally argentiferous arsenopyrite, galena, sphalerite and pyrite, and chalcopyrite associated with occasional malachite and chrysocolla. The property has steam and electric power and a small smelter, employing circa 600 men, production and forces having been materially increased, since bought, 1896, by Mitsui & Co. Production, 1900, was 537,487 kin of lead, 148,670 momme silver and only 8,475 lbs. fine copper.

The Mozumi mine, at Kamioka-mura, Yoshiki-gori, Hida, near the Kamioka mine, is an old property, opened 1573, and is primarily a silver-lead mine, but secures a little copper as a by-product. Production, 1900, was only about one-tenth as much fine copper, as was secured in 1897.

In addition to metalliferous mines, Mitsui & Co., are extensive miners of coal, and their various properties are handled with technical skill, and are equipped on modern and effective lines.

MITTERBERG COPPER CO., LTD.**AUSTRIA.**

Offices: 16, St., Helens Place, London, E. C., Eng. Mine office: Innsbruck Tyrol, Austria. Employs circa 500 men. C. C. Turnbull, chairman; G. B. Elkington, vice-chairman; preceding officers, J. Oppenheim and G. Muir Ritchie, directors; H. Read Smith, secretary; Rood Addie, consulting engineer; Chalmers, Wode & Co., auditors. Organized December 14, 1905, with capitalization £200,000, shares £1 par; issued, £75,000. Shares are listed on the London Stock Exchange.

Lands, 10 mining claims and 10 prospecting claims, area 1,551 acres, also 3,304 acres of timber lands, 15 miles from Bischofshofen, midway between Salzburg and Innsbruck, in the Austrian Tyrol, including the Mitterberger mine. Country rocks are argillaceous Silurian schists, limestone and dolomite, showing 3 parallel veins, known as Josephi, Johanni and Marien, of 6' to 9' average width, carrying auriferous, argentiferous and nickeliferous chalcopyrite, associated with arsenopyrite, pyrrhotite, and spathic iron ore, with gangue chiefly of quartz. These veins do not carry values simultaneously, there being only one payable lode in a given cross-section, mineral values switching from time to time. The veins carry high values, in stringers of 1" to 30" width, with balance of ore body payable, and averaging perhaps 3% copper. This mine has been worked for many years, and has extensive underground openings, being estimated to show 3,000,000 tons of ore, with circa 400,000 long tons blocked out for stoping. The mine was developed exclusively by tunnels, with small concentrators at the portals, whence selected ore was sent 13 miles, to Ausserfelden, for smelting. The smelter is very old-fashioned, and is to be rebuilt upon a modern scale, and the company plans making a considerable outlay in mining development and in building a new concentrator and smelter, with capacity to make circa 4,500,000 pounds fine copper yearly. Two shafts will be sunk, to open the deeper levels of the

mine. Production, 1905, was 1,254,400 lbs. fine copper. Management is considered good, and the property is regarded as decidedly promising.

MITTERBERGER KUPFERGEWERKSCHAFT.

AUSTRIA.

Succeeded, December, 1905, by Mitterberg Copper Co., Ltd.

MIZUSAWA MINE.

JAPAN.

Owned by Furukawa Copper Co.

MOAB COPPER MINING CO.

N. UTAH.

Office and mine: Moab, Grand Co., Utah. Organized Nov. 2, 1905, under laws of Utah, to take over sundry claims in the La Sal district.

MOBILE MINE.

GEORGIA.

An old and idle mine, slightly developed, in Fannin county, Georgia.

MINA MOCTEZUMA.

MEXICO.

Mine office: San José de Guadalupe, Durango, Mex. Roman Gaitau, owner and manager. Is opened by tunnel.

MOCTEZUMA-ARIZPE DEVELOPMENT CO., S. A.

MEXICO.

Office and mine: Apartado 130, La Cananea, Sonora, Mexico. J. P. Hallihan, president; James A. Kirk, vice-president; G. B. Cash, secretary; V. R. Walling, treasurer; F. S. Wilhelm, manager. Organized November 20, 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$5 par; issued, \$100,000. Lands, 765 claims, lying circa 17 miles southeast of Cananea, including the Alacran mine, of 75 pertenencias; El Rey de Cobre, of 125 pertenencias; Victoria, of 24 pertenencias, and Palo Seco, of 86 pertenencias. The Alacran mine has a 150' shaft, showing oxidized ore of \$100 to \$120 per ton value, on the 100' level, and sulphide ores, worth up to \$150 per ton, on the 150' level. Two carloads of second grade ore, shipped April, 1906, gave smelter returns of \$75 per ton.

MOCTEZUMA COPPER CO.

MEXICO.

Office: 20-99 John St., New York. Mine office: Nacozari, Moctezuma, Sonora, Mexico. Employs circa 600 men. Jas. Douglas, president; A. C. James, vice-president; Geo. Notman, secretary and treasurer; Jas. S. Douglas, superintendent; Geo. Kingdon, minesuperintendent; Al. Berner, mill superintendent; D. S. Giddings, engineer; Dr. A. Sandberg, metallurgist; Geo. M. Douglas, superintendent motive power. Organized under laws of West Virginia, with capitalization \$3,000,000. Is a close corporation, owned and managed by the members of the firm of Phelps, Dodge & Co.

Lands, sundry claims, area circa 2,000 acres, in the Moctezuma and Arizpe districts of Sonora, include the Pilares de Nacozari mine, 6 miles east of Nacozari, also the Juárez and Nicolas ranches, area circa 35,000 acres, the mine lying in a rough, hilly country, near the divide between the Yaqui and Oposura rivers. The ores occurs in a broad friction zone, in which the original rock has been broken into pieces ranging in size from gravel up to masses of many tons in weight, the country rock in this crushed zone being porphyry, which also is the matrix of the ore, this being mainly auriferous chalcopyrite, with occasional bornite, associated with iron pyrites, with no clearly defined footwall and with a hanging-wall dipping at an angle of about 80°. There is a small outcrop of rich carbonate ore, but croppings are mainly red-stained porphyry, showing

considerable low-grade hematite. The leached zone is about 20' in depth only, with pay-ore coming in at 60'. The ore body apparently is about 800' wide by 1,500' long, on surface, the area increasing at depth. The matrix is a fine-grained silicious rhyolite, and the ore averages about 2.7% in copper tenor, as mined, before concentration. Development is mainly by tunnel, the 3,500' Porvenir tunnel having 20" gauge railway tracks, with extensive drifting at either side, with storage bins in a 25x100' chamber, to which ore is milled down from the upper workings. The main working shaft is 600' deep, with 4 levels opened, showing some enormous stopes, one of which, No. 4, on the 3d level, is 85' high, 125' wide and 150' long. The mine has shafts of 2,570' aggregate depth, and tunnels with a total length of 5,100', the underground workings exposing an immense amount of ore, with 1,500,000 tons blocked out for stoping.

The 600-ton concentrator, in 2 sections, is equipped with 2 Blake crushers, 4 sets of 54x3" roughing rolls, 2 sets of finishing rolls, 24 revolving screens, 48 Hartz jigs, ten 5' Huntington mills, 56 six-foot Frue vanners, 20 Bartlett tables, hydraulic classifiers and 7 settling tanks. Slimes from the settlers are worked by vanners exclusively, and rolls are used in crushing, to obviate sliming, as far as possible. Tailings are reground and treated on Frue vanners. The power equipment of the concentrator includes five 50-h. p. motors, eight 30-h. p. motors and one 20-h. p. motor. This concentrator, designed by Dr. L. D. Ricketts, saves upwards of 90% of the original ore values, although the ore is not easily amenable to treatment. The matter of increasing the mill to a daily capacity of 1,000 tons is said to be under consideration.

Mine, mill and smelter are connected by a 6-mile narrow-gauge railway, and it is planned to rebuild and extend this line.

The smelter, five miles from the mine, has two 42x130" elliptical water-jacket furnaces, of the Copper Queen type, flanked by tilting wells that can be tilted both front and rear. A 75-h. p. dynamo furnishes blast. Fumes from converters and furnaces pass into an 8' horizontal steel flue, leading to a 750' brick flue, discharging into a 70' brick stack. The converter department has 2 stands, with 96x114" shells, of the Copper Queen type. The smelter was closed September, 1904, upon completion of the railroad line from Cos to Nacozari, all concentrates going to the Douglas Reduction Works of the Copper Queen, 77 miles distant, over the Nacozari Railroad, owned by Phelps, Dodge & Co., and built for the Moctezuma mine.

The Moctezuma has steam and gas power, mainly the latter, which has proven more economical. The gas plant has Loomis-Pettibone generators, making both producer and water gases, which are stored in separate gasometers of 15,000' and 5,000' capacity, respectively, gases being mixed in due proportions before use. The consumption of fuel is under 3 lbs. of very inferior wood per h. p.-hour. The power plant has 8 single-cylinder 100-h. p. Crossley gas engines, of the 4-cycle type, with 18.5" cylinders and 24" stroke, making 200 revolutions per minute, each direct-connected to a 65-kw. direct-current generator, and one 200-h. p. Crossley engine driving a 150-kw. generator. Power for the various departments of the mine, concentrator and smelter, is furnished

from this central station, current being distributed at 250 volts to some 40 motors, installations ranging from 5 to 175 horse power. Electric power for the mine is transmitted 6 miles, at 6,600 volts, and at the mine is stepped down by transformers to 230 volts, for the pumps, while the hoists and electric locomotives use a 250-volt direct current. The gas-engines are started by compressed air, requiring only one to three impulses. The plant has arc and incandescent electric lights throughout. Buildings are mainly of steel, with a brick machine shop. Water is pumped from a well in the river, by one triplex and three Worthington pumps, to a reservoir, and wash-water from the concentrator is settled and used repeatedly.

The company has a general store, and maintains both English and Spanish schools. A new hospital and a public library, similar to those at the Copper Queen and Detroit mines, are to be built. Native labor is paid \$2 to \$3, Mexican, per 10-hour day. Production, 1904, was 9,632,000 lbs. fine copper, and, in 1905 was circa 10,800,000 lbs. fine copper. The company has expended several millions of dollars in development work, and despite the very low grade of the ore, and its refractory nature, has opened and equipped a successful mine and plant. Improvements now under way, or contemplated, should nearly double the productive capacity of the property, by 1907. The management is excellent in every respect.

MODEL GOLD MINING CO.

ARIZONA.

Dead. Property, the McCabe mine, was sold, circa January, 1906.

MODERN COPPER MINING CO.

ARIZONA.

Office: care of H. B. Coon, secretary, Utica, N. Y. Mine office: Bisbee, Cochise Co., Ariz. Employs 16 men. N. A. Centers, president; O. H. Briggs, vice-president and general manager. Lands, 28 unpatented claims, area circa 500 acres, in the northwestern end of Tombstone Cañon, in the Warren district, showing 5 fissure veins, carrying carbonate and sulphide ores, of which one vein is slightly developed, this giving average assays of 7% copper, 10% lead, 14 oz. silver and 1 oz. gold per ton. Has shafts of 25', 40', 50', and 100', and is driving a tunnel, to strike a vein claimed to show a gossan outcrop.

MODOC MINING CO.

NEW MEXICO.

Mine office: Organ, Donna Ana Co., N. M. Ores are mainly argentiferous lead and copper sulphides, and property was a fair producer before present ownership. A small dry-concentrating plant having proved unsuccessful, management has ordered a new mill.

MOGOLLON GOLD & COPPER CO.

NEW MEXICO.

Office: 290 Broadway, New York. Mine office: Cooney, Socorro Co., N. M. Employs 30 men. Thos. J. Curran, president and general manager; Walter D. Buchanan, vice-president; Geo. H. Masten, secretary and treasurer; preceding officers, Geo. W. Stubbs and William J. Weatherby, directors; James P. Batchen, superintendent; J. D. Murphy, mine superintendent; Robert G. Roilley, mill superintendent. Organized September 12, 1901, under laws of New Mexico, with capitalization \$1,250,000, shares \$1 par; issued, \$950,000. Bonds, \$350,000 authorized, \$105,000 issued. Has paid dividends of \$22,500, to March 12, 1906.

Lands, 29 claims, area 500 acres, partly patented, also a 40-acre millsite, in the Cooney district, lying circa 85 miles northeast of Silver City, the nearest railroad point. Lands include 5 groups, known as the Cooney, Peacock, Little Charley, Independence and Fluoride, in the Mogollon Mountains. The Peacock mine has a 400' shaft, about 1,500' distant from the Cooney shaft, and connected therewith by drifts on several levels. The Cooney group, 9 claims, is developed by a 550' two-compartment main shaft. The mine is opened on a fissure vein, in porphyry and andesite, that averages 5' to 10' width, with occasional width much greater, carrying a paystreak of 3' to 30' width, with numerous narrow feeders, some of which carry very high values in gold. Ores are principally slightly auriferous and highly argentiferous chalcocite, bornite and chalcopyrite, with silver values increasing in depth. The Cooney has 6 levels opened, and the Cooney and Peacock have been producers of ores to the estimated value of \$1,250,000, in the past.

MOHAWK MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Kearsarge, Mich. Mill office: Gay, Mich. Jos. E. Gay, president; John R. Stanton, secretary and treasurer; Fred Smith, superintendent; preceding officers and Wm. A. Paine, directors; Willard J. Smith, assistant superintendent; Frank Getchell, clerk; B. S. Shearer, mill superintendent; John Trevorrow, mining captain; F. Wm. Hartmann, engineer. Organized November, 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$21 paid in. Annual meeting, last Tuesday in March. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., Boston, transfer agent.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,799,378.00
Amount paid in by conveyance of property.....	450,000.00
Entire amount invested in real estate	456,236.17
Amount of personal estate.....	521,716.37
Amount of floating debt.....	137,775.08

Mineral lands, 800 acres, forming an irregular tract having its axis on the strike of the lode, in Sections 27, 28, 33 and 34, T. 57 N., R. 32 W., Keweenaw county, Michigan. The Kearsarge amygdaloid lode, on which the mine is opened, outcrops for about one mile on the Mohawk tract, and the deepest shaft can be sunk on the dip of the lode for nearly one and a half miles, on the company's lands. The Mohawk is 4 miles northeast of Calumet, and has the Ahmeek and Seneca on the north, the Bacon & Jacob tract on the east and south, and the Ahmeek on the west. The Mohawk, formerly known as the Fulton, was supposed to lie too far east to carry the outcrop of the Kearsarge lode, until the Kearsarge bed was found, accidentally, by the cutting of a wood-road, circa 1896. The property carries sundry other cupriferous amygdaloid beds, which may be given attention later, work wisely having been confined to the development of a mine on the Kearsarge bed.

Crossing the amygdaloidal bed, at approximately right angles, and with nearly vertical dip, are 3 fissure veins, carrying sundry arsenides of copper,

including stibio-domeykite, mohawk-whitneyite, mohawkite and keweenawite, the two latter being peculiar to this mine and described in the chapter on mineralogy. The most important commercially is mohawkite, this occurring in considerable quantities in the upper north drifts of No. 1 shaft, the vein ranging 3" to 3' in width and being mineralized at the crossing of the amygdaloid bed, and for an indefinite, but usually short, distance, on either side. The mohawkite and allied arsenides of copper occasionally occur massive, but commonly are disseminated in an arenaceous gangue, and after hand-cobbing carry values of \$100 to \$150 per ton. On the 6th and 7th levels the mineral contents of the principal fissure vein are small, and apparently the production of mohawkite for the future will be trifling.

The Mohawk has 5 shafts, numbered from north to south. New mine openings, 1905, aggregated 10,812'. The mine is running circa 50 powerdrills. The use of concrete stringers was begun in 1905, in shafts 1, 2, 3 and 4, at the bottom of the wooden timbering formerly installed, and No. 5 has concrete stringers from surface. The wooden sleepers in the four older and deeper shafts will be replaced by concrete, from time to time, as the wood decays.

No. 1 shaft, located circa 1,500' south of the point where the outcrop of the lode passes over the Mohawk's northern boundary, was 1,400' deep at the end of 1905, and shows material improvement, being the best shaft of the mine at the end of the year.

No. 2 shaft, located 1,100' southwest of No. 1, was 1,300' deep at the end of 1905, and shows a marked improvement below the 12th level.

No. 3, lying 1,100' southwest of No. 2, ended 1905 at a depth of 950', and opens poor ground, but the rock is softening in the two bottom levels, and an improvement at greater depth, such as has occurred in the two shafts next north, is looked for, with reasonable certainty.

No. 4, lying 1,300' southwest of No. 3, was 900' deep at the end of 1905, and opens good ground from surface down.

No. 5, the southernmost shaft, lying 1,800' south of No. 4, and begun 1904, ended 1905 at a depth of 300', with a satisfactory showing of copper.

The shafts are of uniform size, 8x18' inside of timbers, with solid cribbing through the overburden, and are to have identical equipments. Shafts 1, 2 and 4 have duplicate Nordberg compound conical-drum hoists, good for a depth of 6,000', and similar hoists are to be installed, eventually, at Nos. 3 and 5. Shafts 1, 2, 3 and 4 have combination shaft-rockhouses, fitted with 12x24' Nordberg engines and rock-crushers. The lode runs 15' to 18' wide, or about the same as at the Wolverine, and is somewhat richer than the Wolverine was at similar depth, but not so rich as the Wolverine now is in its bottom workings.

A power plant, near No. 2, serves both shafts 1 and 2. This has an engine-house and boiler-house of mine-rock, with redstone trimmings. Shafts Nos. 3 and 4 have individual engine-houses and boiler-houses, the buildings at No. 4 being of redstone. The equipment at No. 5 is temporary throughout to be replaced later. No. 5 shaft has an old straight-face drum from No. 1, and a temporary rockhouse with one crusher. A 60-drill Ingersoll-Sergeant air-compressor is located at No. 4 shaft, and the old compressor at No. 3 shaft

is maintained as an auxiliary. Miscellaneous surface improvements include a machine-shop, smithy, combination carpenter shop and warehouse, 30x40' office building, and a well-equipped hospital.

The Mohawk mill, at Gay, standing opposite the Wolverine mill, is near the mouth of the Tobacco river, on Traverse Bay, Lake Superior. A 20,000,000-gallon triple-expansion Snow pump furnishes water for both mills, the pumphouse standing near the river, from which water is taken. The mill is 178x206' in size, of steel frame, sheathed with iron, on foundations of sandstone, quarried from the company's own lands. A steel trestle, 350' long and 50' in extreme height, leads into the mill, loaded cars being pulled up this incline by a winding engine. The mill has 4 stamps, the fourth having been completed November, 1905, but only 3 heads are in commission, one being compounded, giving two Nordberg steeple compound heads and two single cylinder heads. The mill has 3 sets of auxiliary crushing rolls, with fixed bearings, to reduce the oversize material from the mortar-boxes of the heads, this averaging 20% to 25% of the gross amount of rock stamped, giving the single-stage stamps a daily capacity of 500 tons each, working on the soft rock of the Kearsarge lode. Mineral from the wash discharges automatically into pipes, and is sluiced into the basement of the mill, where it is shoveled into 1½-ton mineral cars, having 14-mesh perforated steel bottoms, allowing the draining out of water, after which the cars are weighed, then lifted by a cage elevator and dumped into bins. The bin-house has four compartments, each having a cement floor, with steam pipes underneath, for drying out the remaining moisture from the wash. The mineral goes from the bin-house into self-dumping steel mineral cars, in which it is hauled to the Michigan smelter, at Houghton. The mill is equipped with the latest washing machinery and has a Chilean regrinding mill and trolley carriers for barrel copper. A steel boiler-house, adjoining the mill, has four 250-h. p. Stirling water-tube boilers. The townsite at the mill, named in deserved honor of Jos. E. Gay, long and actively identified with honest and successful copper mining in the Lake Superior district, has streets, water mains and hydrants, with a number of substantial dwellings, occupied by employees. The wharf, on Traverse Bay, a short distance from the mill, is 30x300' with 14' of clear water alongside, and is fitted with coal-hoists and storage sheds, ample for the needs of both the Mohawk and Wolverine mines.

Production, 1905, was 659,291 tons rock hoisted and 586,305 tons rock stamped, yielding 12,577,785 lbs. mineral, which smelted into 9,387,614 lbs. fine copper, giving a net yield of 16.01 lbs. fine copper per ton, equivalent to a metallic percentage of only 0.8005%, as compared with 17.75 lbs. per ton in 1904 and 21.79 lbs. per ton in 1903. For 1906 a small gain in metallic contents of rock treated should be shown. Cost, per ton hoisted, 1905, was \$1.23, and per ton stamped was \$1.38. Total cost of fine copper secured was 9.77 cents per pound for ordinary charges, or 10.91 cents per pound, including construction account. Net earnings for 1905 were \$412,173.13, after extraordinary expenditures of \$131,687.12 for construction account, and for the purchase of sundry timber lands. A consid-

erable surplus was brought forward from the previous year, giving a surplus of \$796,114.42 on Dec. 31, 1905, and dividends of \$2 in January, and \$3 in July, 1906, were paid, and the company should end the year with a larger surplus than was brought forward.

The Mohawk suffered a great loss, in February, 1906, by the death of Mr. John Stanton, the president of the company from its organization, but the management remains in the capable and trustworthy hands of those who have been so long and so honorably associated with Mr. Stanton, in the industry of mining Lake Superior copper for the benefit of the shareholders.

MOHAWK MINING CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. F. S. Bascom, president; E. B. Critchlow, vice-president; Edward W. Duncan, secretary and treasurer. Organized November 28, 1902, under laws of Utah, with capitalization \$150,000. Lands, 7 claims, in the West Mountain district.

MOIRA COPPER CO.

ALASKA.

Office: Milwaukee, Wis. Mine office: Ketchikan, Alaska. Lands, 7 claims, adjoining the Niblack Copper Co., on Prince of Wales Island. Company is said to plan extensive development, during 1906.

MOJAVE COPPER CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Red Rock, Cal.

MOLLIE GIBSON GROUP.

BRITISH COLUMBIA.

A prospect, at Menzies Bay, Discovery Passage, Nanaimo district, British Columbia. A promising ore body was encountered, in 1901. Since idle.

MOLLIE STARK COPPER MINING CO.

WYOMING.

Office: care of Dr. G. A. Thomas, 92 North State St., Chicago, Ills. Mine office: Encampment, Carbon Co., Wyo. J. M. Thomas, Jr., general manager. Has a 400' tunnel, opening a contact vein, and has shipped a little ore to the Penn-Wyoming smelter. Presumably idle.

MONA & PARYS MINES, LTD.

WALES.

Offices: Amlwch, Anglesey, Wales. R. Bridson, secretary. Organized Jan. 13, 1899, with capitalization £75,000, shares £1 par; issued, £58,000. Debentures, £20,000 first mortgage, at 6%, and £10,000 second mortgage, at 7%. Lands, 1,067 acres, with improved water-frontage, warehouses, ochre works, tramways, etc. Makes a little copper, by cementation, from mine-waters. Mines in this district were worked by the Romans. The Parys mine was opened 1768, and made 3,000 tons of copper in 1784. Present production is 25 to 50 tons fine copper yearly.

MONARCH CONSOLIDATED GOLD & COPPER

COLORADO.

MINING & SMELTING CO.

Office: 1932 Thirteenth St., Boulder, Colo. T. S. Waltenmeyer, president and treasurer; Charles A. Wolcott, vice-president; F. H. Wolcott, secretary. Organized September, 1903, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par. Has an authorized bond issue of \$300,000, running 3 years, at 6%. Lands include the Buena and Pilot mines, at Sunshine, Colorado, which are gold properties, and the Copper

King group, on the south fork of the Grand river, in Middle Park, Grant county, Colorado, latter having an area of 1,740 acres, carrying 3 miles of the strike of a copper vein said to be of 15' to 50' width. The Copper King group has a 25-h. p. hydro-electric installation, and developments are suspended, awaiting the building of the Moffat railroad, under construction in 1906.

MONARCH COPPER MINING CO.**CALIFORNIA.**

Office: 326 Post St., San Francisco, Cal. Letter returned unclaimed from alleged mine office, Callahan, Siskiyou Co., Cal. C. F. Pattey, president; Chas. K. Dickenson, secretary and treasurer. Organized under laws of South Dakota, with capitalization \$200,000, shares \$1 par. Lands, claimed to be 640 acres, claimed to show two veins carrying cuprite, melaconite, malachite, azurite, chalcocite, bornite and chalcopyrite, claimed to be opened by a 200' tunnel, claimed to give assays of 11.25% copper and \$2.50 gold per ton, with traces of silver. Also is claimed to have a vein of auriferous and argentiferous galena. Was put on the market by that notorious bunco-steerer, "Baron" W. E. von Johannsen, hence presumably is an addled egg.

MONARCH GOLD & COPPER MINES, LTD.**BRITISH COLUMBIA.**

Dead. Letters returned unclaimed from former office, Portland, Oregon, and former mine office, Nelson, B. C.

MONARCH GOLD & COPPER MINING CO.**ARIZONA.**

Office: 219-53 State St., Boston, Mass. John B. Hathaway, president; Geo. E. Warren, secretary; G. P. Morrill, treasurer; C. L. Barker, general manager. Lands, sundry claims, in the Big Bug district of Yavapai county, Arizona, showing slightly cupriferous gold ores. Idle several years.

MONARCH MINES & SMELTERS CORPORATION.**UTAH.**

Office: care of Hon. A. B. Lewis, 100 Broadway, New York. Organized 1904, with capitalization \$30,000,000, to take over sundry Nevada and Utah copper properties. Cannot be learned that any work has been done.

MONARCH MINING, MILLING, TUNNEL, TRANSPORTATION & POWER CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. E. McClelland, superintendent. Property is the Freeland mine, carrying ores of gold, silver, copper and lead. Has electric power.

MONARCH MINING & SMELTING CO.**ARIZONA.**

Office: care of H. O. Thomas, secretary, Peoria, Ills. Mine office: Wickenburg, Maricopa Co., Ariz. P. G. Rennick, president; Walter H. Kirk, vice-president; preceding officers, H. J. Charles, E. R. Dosier, E. L. Martin and Geo. I. Root, directors; C. W. Platt, superintendent; J. B. Tomlinson, consulting engineer. Organized August, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, held under working bond and lease, in the Black Rock district, 9 miles south-east of Wickenburg, opened by a tunnel showing ore giving assays of 3% to 20% copper and \$3 to \$15 gold per ton, with average values of \$8 per

ton. Company claims to have 50,000 tons of ore in sight. Management is said to plan building an electric power plant, between Wickenburg and Hot Springs Junction.

MONARCH-SMUGGLER MINING & REDUCTION CO.

COLORADO.

Office: 521 Commonwealth Bldg., Denver, Colo. Earl W. Kelly, president and general manager; Fred S. Sweet, vice-president; J. Horace Shepard, treasurer; preceding officers, Eda D. Kelly and Oscar Soronsen, directors; Charles E. Dawson, secretary. Organized January 2, 1906, under laws of Colorado, with capitalization \$3,000,000, shares \$1 par. Lands, 14 claims, area 137 acres, in the Harmon district of Grant county, Colorado, circa 50 miles northwest of Denver, said to show surface ores assaying \$6 to \$98 per ton. Company planned beginning work in spring of 1906, on a projected 1,500' tunnel, designed to cut the main vein at 800' depth.

MOND NICKEL CO., LTD.

ONTARIO.

Offices: 39, Victoria St., London, S. W., Eng. Mine office: Victoria Mines, Algoma, Ont. Works office: Clydach, Wales. Dr. Ludwig Mond, F. R. S., chairman; Robert Mathias, secretary; Dr. Bernard Mohr, general manager; Hiram Hixon, mine manager. Organized Sept. 20, 1900, with capitalization £600,000, in 300,000 ordinary shares, par £1, 50,000 deferred shares, par £1, and 50,000 cumulative 7% preference shares, par £5. Paid a 6% dividend on ordinary shares, 1905.

Lands, 3,350 acres freehold and 1,550 acres leasehold under 3-year option, in the townships of Blezard, Denison, Snider and Garson, Sudbury district, Algoma, Ontario, carrying cupriferous and nickeliferous pyrrhotite, quite extensively developed. The Victoria mine, which is the principal producer, has a 650' vertical 3-compartment shaft, 4x12' inside of timbers. The 8th level, at the bottom, shows the ore bodies maintaining both width and grade. The North Star mine, lying northeast of the Creighton mine, in Snider township, has some development also. The Victoria mine shows 2 lenses of nickeliferous pyrrhotite and chalcopyrite, with east and west strike, connected by stringers, in schistose diorite near a granite contact. The Victoria mine has a separate shafthouse and rockhouse, at No. 1 shaft, with 5-drill and 10-drill Rand straight-line air-compressors, hoists, etc.

An 11,000' Bleichert aerial tram connects the Victoria mine with the roast-heaps and smelters, the tramway being self-operating, owing to steep incline secured. The works also have direct rail connection with the Canadian Pacific railway. The smelter building, of steel, sheathed with corrugated iron, has 2 water-jacket blast-furnaces, 2 stands of converters, traveling cranes, and a power plant with five 100-h. p. return tubular boilers, Riedler air-compressor, 2 Connorsville blowers with direct-connected engines, and a 125-kw. dynamo.

The refining works are in the Swansea Valley, at Clydach, Wales. The bessemerized copper-nickel matte from the smelter is dead-roasted and treated with dilute sulphuric acid, which permits the extraction of about two-thirds of the copper and 2% of the contained nickel. The residue, after drying, assays 45% to 60% nickel, and is treated, in charges of 500 kgs.,

with water-gas, in a reduction tower, at a temperature of about 300° Centigrade. This tower has shelves, and the ore is removed from shelf to shelf by automatic rakes, the lower shelves being cooled. After treatment in the reduction tower, the charge is transferred to a volatilizing tower, and treated with carbon monoxide, at a temperature of about 100° C. The residue therefrom is returned to the reducing tower, and the charge goes forward and back between the two towers, for 10 to 15 days, and when 60% of the nickel has been volatilized, as nickel carbonyl, the residue of the charge is returned to the roasting furnace. The nickel carbonyl is treated in a decomposing apparatus, wherein the metal is recovered in granules, assaying 99.4% to 99.8% nickel. The copper is turned out as bluestone.

MONEY METALS MINING CO.**ARIZONA.**

Mine office: Prescott, Yavapai Co., Ariz. W. H. Rensch, president. Lands, 8 claims, fairly timbered, in the Black Hills district, 3 miles south of the Yaeger Canyon Copper Co., and 6 miles from a railroad, giving good assay values in gold, silver, copper and lead, from surface ores. Company plans sinking a shaft to a possible depth of 1,400'.

MONITOR MINE.**MONTANA.**

Mine office: care of Hon. H. J. Rossi, Wallace, Idaho. Mine office: Saltese, Missoula Co., Mont. E. P. Spaulding, consulting engineer; Thos. Jay, superintendent. Lands, sundry claims, near the Richmond mine, circa 6 miles east of Mullan, Idaho. Development is by a 300' shaft, planned to be sunk to 500' depth, said to show a 12' vein of ore carrying gold and copper values up to \$60 per ton. Vein is 3' to 12' wide, showing considerable native copper and chalcopryite, assaying up to 20% copper and \$4 to \$10 gold per ton. Mine shipped some ore, of about \$25 per ton average value, during 1905. Property is worked during the summer seasons only.

MONITOR MINE.**MONTANA.**

The Butte mine of this name is owned by the Anaconda Copper Co.

MONITOR MINING CO.**BRITISH COLUMBIA.**

Letters returned unclaimed from former mine office, Alberni, B. C.

MONTAGNAT MINE.**NEW CALEDONIA.**

Mine office: Diahot, New Caledonia. Is said to have an ore body of considerable size, slightly developed. Idle.

MONTANA & ARIZONA CONSOLIDATED COPPER CO.

Charter surrendered and company discontinued, circa 1902.

MONTANA & ARIZONA COPPER MINING CO.

Letter returned unclaimed from former office, 68 State St., Boston, Mass.

MONTANA BELLE COPPER CO.**ARIZONA.**

Office: 1604 Arapahoe St., Denver, Colo. Chas. H. Pierce, president; A. L. Emberson, general manager; A. R. Bain, secretary and treasurer; preceding officers, A. T. Cronin and Luther Bain, directors; Chas. A. Smith, consulting engineer. Organized under laws of Arizona, with capitalization \$800,000, shares \$1 par. Lands, 3 claims, area 60 acres, in the Ellsworth district, 1 mile west of Cunningham Pass and 6 miles north of Welton, Yuma county, Arizona, in the Harcuvar Mountains, 6 miles from a railroad, said

to show a vein of 8' to 25' width, with a good gossan outcrop, carrying oxidized ores to depth of 100' and 150', with sulphides below. Advertising of the company is too flamboyant, and very misleading on many points, the statements as to dividends and advances in price of mining shares, etc., being entirely incorrect.

MONTANA CONSOLIDATED MINING CO.

MONTANA.

Letters returned unclaimed from former office, 79 Wall St., New York, and former mine office, Saltese, Missoula Co., Mont.

MONTANA COPPER & GOLD MINING CO.

MONTANA.

Controlled by International Copper & Gold Co.

MONTANA COPPER MINING CO.

MONTANA.

Dead. Lands were near Helmville, Lewis & Clark county, Montana.

MONTANA COPPER & SILVER MINING CO.

MONTANA.

Office: Butte, Montana. Mine office: Clancey, Jefferson Co., Mont. Capitalization \$200,000, shares \$10 par. Lands, 4 claims, 2 miles from Clancey, opened by a 200' shaft. Active development was resumed April 1, 1906.

MONTANA & MICHIGAN MINE.

MONTANA.

A property by this name is said to have a 700' tunnel, showing ore assaying up to 19% copper, on Canyon creek, Teton county, Montana.

MONTANA MINERAL LAND DEVELOPMENT CO.

MONTANA.

Office: Ferguson Blk., Pittsburg, Pa. Mine office: Basin, Jefferson Co., Mont. Thomas C. Kelly, president; John G. Mizer, vice-president and treasurer; Frank J. Weixel, secretary; James Humes, general manager. Organized 1902, under laws of Montana, with capitalization \$3,500,000, shares \$1 par. Lands, 19 claims, area circa 300 acres, in the Cataract district. Country rocks are granite, showing fissure veins carrying sulphide ores, mainly chalcopyrite. One vein, of 100' width, is opened by an 850' shaft, and tunnels of 525', 1,400', 700' and 800', with 3,425' of lateral openings, giving assays of 6% copper, 6% to 12% lead, 15 oz. to 30 oz. silver, and 20 cents to \$3 gold per ton. Company estimates 50,000 tons blocked out for stoping. Has a steam plant of 200 h. p., with two 75-h. p. hoists, good for 2,000' depth, and a 4-drill Ingersoll-Sergeant air-compressor. Has a 20x40' log machine shop, 20x30' smithy, 24x30' carpenter shop, and 30x80' engine and boiler house. Concentrator, of logs, is 35x120', with a 7x10' Blake crusher, 1 set of rolls, eight 3-compartment jigs and 2 Wilfley tables. Property has produced 7,000 tons of ore, sold for \$166,238, and is regarded as promising.

MONTANA MINING & DEVELOPMENT CO.

MONTANA.

Idle and practically dead. Fully described in Vol. V.

MONTANA ORE PURCHASING CO.

MONTANA.

Office: 31 Nassau St., New York. Mine office: Butte, Silver Bow Co., Mont. F. August Heinze, president and general manager; John MacGinnis, vice-president; Arthur P. Heinze, secretary; Stanley Gifford, treasurer. Organized 1883, under laws of Montana, with capitalization \$2,500,000; debentures, \$1,000,000 first mortgage 6% bonds. Is controlled by the United Copper Co., which holds 76,791 shares out of 80,000 shares issued, and owns the

entire issue of bonds. Mining property was sold, 1906, to Butte Coalition Mining Co.

**MONTANA SCOTCH BONNET COPPER
& GOLD MINING CO.**

MONTANA.

Office: Davenport, Wash. Mine office: Cooke, Park Co., Mont. C. A. Wilcox, superintendent. Lands include the Cora, Maggie and Jennie V. groups, carrying ores of gold, silver and copper, in the New World district, 70 miles from a railroad. A shareholder complains that management will give him no information, and that he considers the company a swindle.

MONTANA VERDE COPPER CO.

MONTANA.

Letter returned unclaimed from former office, 21 Park Row, New York. Mine office: 82 Owsley Blk., Butte, Silver Bow Co., Mont. Jos. Johnston, general manager; N. F. Norman, secretary and treasurer. Organized 1902, under laws of South Dakota, with capitalization \$2,500,000, shares \$1 par. Lands, 16 claims, in the Bernice district of Jefferson county, 30 miles from Butte, showing a large body of low-grade ore, traversed by numerous small veins, carrying high values in copper and gold, developed by tunnels of 275' and 350'. Has steam power and a 10-stamp mill. Presumably idle.

MONTANA ZINC CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. A. L. Strasberger, president; C. A. Wimpfheimer, vice-president; Clarence B. Wisner, second vice-president and general manager; Maurice Isenberg, third vice-president; A. L. Bailey, secretary and treasurer; Bayard T. Spaulding, assistant manager; Chas. W. Leimer, superintendent. Capitalization \$300,000, but company is said to plan increasing same to \$2,500,000. Property is the Emma mine, having an 800' shaft, showing a mineralized formation of about 300' width, carrying up to 2% copper only, but with considerable zinc values and small gold values. Had an option on the property of the Alice Gold & Silver Mining Co., but allowed same to lapse. The Alice mill is held under lease, and was remodeled, 1905, for treating zinc ores. The mill, early in 1906, was treating circa 125 tons daily, of Lexington zinc ore, furnished by La France Copper Co.

HILARIO MONTAÑO.

MEXICO.

Office and mine: Guachinango, Jalisco, Mex. Lands, 8 pertenencias, showing strong veins, carrying auriferous and argentiferous copper ore, with antigua workings and recent development by present owner.

SOCIÉTÉ DES MINES DE CUIVRE DE MONT CHALMERS.

AUSTRALIA.

Voluntarily wound up, May 1, 1901.

SOCIETÀ ANONIMA DELLE MINIERE DI

ITALY.

MONTECATINI.

Offices: 49, Piazza Santa Apostoli, Rome, Italy. Mine office: Bocchegiano, Grosseto, Italy. Works office: Leghorn, Italy. Employs circa 700 men. I. Castellbolognesi, president; Alfred Deschars, vice-president; Alfredo Santori, secretary; Paolo Marengo, general manager; Paolo Cerrina, superintendent; Guglielmo Vallada, engineer. Organized 1888, with capitalization 5,000,000 lire, shares 100 lire par. Paid dividends, 1899-1902, of 82 lire per share.

Holdings include the Montecatini, Fenice Massetana, Capanne Vecchie and Bocchegiano mines, all very ancient properties, worked successively by the Etruscans, Romans, Goths and Italians. Massa Marittima, 20 miles distant, on the Mediterranean railroad, is the nearest station. The gangue of the Montecatini ores is a brecciated red porphyry, carrying chalcopyrite, bornite, disseminated and massive chalcocite and occasional native copper, the ores averaging about 3.5% in tenor, as mined. Present development is by one shaft of 125 metres and 5 tunnels, giving about 8,000 m. of underground openings, with about 500,000 tons of ore in sight. The property is equipped with steam power and has a concentrator with 5 crushers.

The dressed ores sent to the smelter average about 36% from the Montecatini mine, and about 11% each from the Massetana and Bocchegiano mines. The smelter, at Leghorn, has 4 reverberatory furnaces and a converter plant, also a sulphuric acid plant for the utilization of the sulphur, ores of 3.5% tenor in copper carrying about 40% sulphur. For the 7 years, 1895-1901, the company produced 257,332 tons of ore of all grades, the average being, for first grade, 10.67% copper, second grade, 3.44% copper and 45% sulphur; third grade, 2.67% copper, the average of all grades for 7 years being 3.68% copper and 28.15% sulphur. Production, 1905, was as follows, in metric tons: Montecatini mine, 1,197 tons ore, averaging 10.17% copper, yielding 122 tons fine copper; Bocchegiano mine, 3,138 tons first grade ore, averaging 8.88% copper tenor, producing 279 tons fine copper, 13,158 tons second grade ore, averaging 3.09% copper, producing 408 tons fine copper, and 441 tons of copper precipitate, averaging 69.25% copper, producing 305 tons fine copper; Capanne Vecchie, 572 tons fine copper, from precipitate; Fenice Massetana, 940 tons of selected ore, averaging 10% copper, producing 94 tons fine copper, and 693 tons fine copper from precipitate, giving a total production by the Montecatini company, for 1905, of 2,673 metric tons, equal to 5,892,895 lbs. fine copper. Production, 1903, was 3,086,440 lbs. fine copper, showing an increase of nearly one hundred per cent, in two years. The company is well managed, both as to finances and physically, with a magnificent market at its doors, and is likely to prove an increasingly important producer, in the years to come.

MONTE CRISTO CONSERVATIVE MINING CO.

ARIZONA.

Mine office: Paradise, Cochise Co., Ariz. Lands, sundry claims, circa 2 miles north of Paradise, at a site formerly known as Gayleyville. Idle.

MONTE CRISTO GOLD & COPPER CO.

UTAH.

Letters returned unclaimed from former office, Salt Lake City, Utah, and former mine office, Milford, Utah. Described in Vol. V.

MONTE CRISTO MINE.

MONTANA.

Letter returned unclaimed from former mine office, Rimini, Mont.

MONTE CRISTO MINING CO.

ARIZONA.

Office and mine: Metcalf, Graham Co., Ariz. Henry Brigham, president; Refugio Murillo, secretary and general manager. Lands, 5 claims, on Chase creek, about 2 miles above Metcalf, carrying a fissure vein in porphyry, showing 3' to 4' of oxidized ores, assaying up to 45% copper, opened by

a shallow shaft and tunnels of 100' and 200'. Made small shipments of ore to Shannon smelter, in 1904. Presumably idle.

MONTEREY GOLD & COPPER MINING CO.

Dead. Disappeared from former office, 11 Broadway, New York.

MONTEREY GOLD MINING CO.

WASHINGTON.

Letter returned unclaimed from former mine office, Bolster, Wash.

MONTEREY SMELTING & REFINING CO.

MEXICO.

Described under Mexican title, Compañía Minera Fundidora y Afinadora de Monterrey, S. A.

COMPAÑIA MINERA FUNDIDORA y AFINADORA

MEXICO.

DE MONTERREY, S. A.

Office and works: Monterey, Nuevo León, Mexico. Capitalization was increased, 1903, to 8,000,000 pesos. Has an extensive smelting plant, and does a large custom business, on silver, lead and copper ores. Production, 1903, was 215,568 lbs. fine copper.

MONTE RUBIO GROUP.

SPAIN.

Under lease to United Alkali Co., Ltd.

MONTEZUMA COPPER CO.

• Letter returned unclaimed from former office, Albuquerque, N. M.

MONTEZUMA COPPER MINING CO.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. Lands, 17 claims, near Globe, several giving a promising showing of ore. Is sinking a vertical shaft.

MONTEZUMA LEAD CO.

MEXICO.

Mine office: Santa Barbara, Parral, Chihuahua, Mexico. A lead and zinc mine, carrying incidental values in gold and silver, with 0.5% to 1% copper. Production is circa 100,000 tons of ore yearly.

MONTEZUMA MINING CO.

MEXICO.

Mine office: La Cananea, Sonora, Mexico. Lands, sundry claims, circa 16 miles from La Cananea.

MONTEZUMA & THE WHIZZERS

SOUTH DAKOTA.

GOLD-COPPER MINE.

Office and mine: Deadwood, Lawrence Co., S. D. Owned by J. T. Gilmore, manager, and the C. W. Carpenter Estate. Lands, 13 claims, patented, area 135 acres, in the Whitewood district, showing a prominent goossan capping, with several cupriferous veins, of which one has an estimated average width of 45', and has been traced 3,000'. Has been worked for gold, to nearly the water-level, and has produced considerable low-grade fluxing ore, sent to the Golden Reward smelter, at Deadwood. Idle at last accounts, but negotiations in progress for sale.

MONTGOMERY GOLD LEAF MINING CO.

NEW JERSEY.

Apparently succeeded by Pahaquarry Copper Mining Co.

MONTPELIER COPPER MINING & SMELTING CO.

IDAHO.

Mine office: Montpelier, Bear Lake Co., Idaho. Fredk. W. Rose, superintendent. Property includes the Duke, Emerald and other claims, carrying argentiferous copper ore. Idle for some years.

**MONTREAL & BOSTON CONSOLIDATED
MINING & SMELTING CO., LTD.****BRITISH COLUMBIA.**

Practically absorbed by Dominion Copper Co., Ltd., which gave one share of its stock for 2 shares of Montreal & Boston, and held upwards of 75% of Montreal & Boston stock issue, at beginning of 1906. Fully described in Volume V.

MONTREAL GROUP.**UTAH.**

Held by Nevada-Utah Mines & Smelters Corporation, at last accounts.

MONTT HERMANOS.**CHILE.**

Office and mine: San Juan, Freirina, Atacama, Chile. Principal properties are the Quebradita, 300' deep, opened 1834; Rosario, 290' deep, opened 1854; Manto, 160' deep, opened 1846, and San José, 180' deep, opened 1851.

MONUMENT COPPER MINING CO.**MONTANA.**

Organized August, 1902, by Alex. S. Christie, et al., of Butte, Montana, with capitalization \$75,000. Lands are on Bloody Dick Creek, 30 miles from Red Rock, Beaverhead county, Montana. Presumably idle.

MOON-ANCHOR COPPER MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. L. W. Tennant, president and general manager; W. J. Wernli, secretary and treasurer. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 3 claims, area 60 acres, on Green Mountain, in the Upper Platte district, said to show a 50' fissure vein of sulphide ore, giving assays up to 10% copper, developed by a 200' shaft. Has steam power. Presumably idle.

MOON GOLD MINING CO.**CALIFORNIA.**

Office: Valley Springs, Cal. Mine office: Richey, Amador Co., Cal. J. B. Lucas, vice-president and general manager. Has two shafts, of 100' and 140'. Vein-stuff is a sulphide mineralization of diabase and talcose schist, carrying gold and copper values. Presumably idle.

MOONLIGHT MINE.**MONTANA.**

Owned by Washoe Copper Co.

MOONMERA COPPER MINING CO., LTD.**AUSTRALIA.**

Offices: 69, Queen St., Brisbane, Australia. Mine office: Moonmera, via Rockhampton, Queensland, Australia. T. G. Dewar, secretary; Samuel Phillips, general manager. Lands, 4 leases, area 200 acres, showing 4 ore bodies, of which 2 are partly developed. Country rocks are sandstone and granite, veins having an arenaceous gangue. Gold is found in the oxidized zone, but values turn to copper at a little depth, ores being mainly sulphide, with a little oxidized ore and some native copper, latter sometimes occurring as flakes and small sheets, but commonly disseminated in small particles. The property also shows large bodies of low-grade carbonate ores. The ores average 1.75% to 2% copper only, but by rejecting about 70% of the ground broken, can furnish 5% ore to the mill, which makes concentrates carrying circa 17.5% copper and 9 dwts. gold per long ton. The mine is opened by shafts of 50' and 93', and by 5 tunnels, of 90' to 280' length.

MOONTA CENTRAL COPPER CO., LTD.**AUSTRALIA.**

Offices: 30, Moorgate St., London, E. C., England, and Adelaide, South Australia. Mine office: Wallaroo, Yorke Peninsula, South Australia. A. Lesser, chairman; John Alex. Russell, secretary; John S. Scott, manager. Organized Oct. 29, 1901, as a reorganization of the Mid-Moonta Copper Mines, Ltd., with capitalization £110,000, shares £1 par, in 50,000 cumulative preference 6% shares and 60,000 ordinary shares. Debentures, £1,400 issued, at 10%. Lands, 152 acres, held under 99-year lease, expiring 1991, from the South Australian government. Has 4 shafts, deepest 432', said to show considerable medium grade ore, with steam power and a small concentrator. Presumably idle.

MOOSE MINE.**MONTANA.**

Owned by Boston & Montana Copper & Silver Mining Co.

SOCIEDAD MINERA DEL MORADO.**CHILE.**

Owns the Arenillas mine, opened 1860, in the department of Freirina, Atacama, Chile. Has a small matting furnace. Idle for several years.

FRANCISCO MORÁN.**MEXICO.**

Office and mine: Mineral de Asientos, Aguascalientes, Mexico.

MORENCI COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, 44 Broadway, New York. Mine office: Morenci, Graham Co., Ariz. Stephen Panish, president; Geo. M. Penny, secretary. Originally known as the Arizona Gold Mining & Milling Co.; reorganized as Gold Cliff Mining & Milling Co.; re-reorganized as Morenci Copper Co. Owned the Micawber claim, hence, presumably is "waiting for something to turn up", to permit another reorganization.

MORENCI COPPER MINES, LTD.**ARIZONA.**

Merged, 1903, into Clifton Consolidated Copper Mines of Arizona, Ltd.

MORGAN-ARGENTINE MINING CO.**UTAH.**

Office: 50 West Second South St., Salt Lake City, Utah. Mine office: Peterson, Morgan Co., Utah. Employs 3 men. Herbert Pembroke, president and general manager; W. H. Croft, vice-president; A. B. Pembroke, secretary and treasurer; Earle Pembroke, engineer; preceding officers, John Croft and S. J. Pembroke, directors. Organized 1900, under laws of Utah, with capitalization \$500,000, shares 1 cent par. Annual meeting, third Tuesday in May. Lands, 11 claims, area 175 acres, in the Argentine district, showing fissure veins in Carboniferous limestone, one vein, ranging 2' to 10' in width, being opened by a shaft of 175', with 2,000' of underground workings, showing ore carrying values in copper, lead, silver and gold.

KUPFERBERGWERK MORGENSTERN.**GERMANY.**

Mine office: Kupferberg, Schlesien, Germany. Employed circa 250 men, at last accounts.

MORMON GIRL MINING CO.**ARIZONA.**

Property, in the Cave Creek district of Maricopa county, Arizona, was leased to North American Exploitation Co., which was promoted by the Western Trust & Guaranty Co., 327 New York Life Bldg., Chicago, Ill., which company reported, 1905, that the property was free from debt, but

numerous attachments were filed, 1905, and property was sold for \$400. Described in Volume V.

MORNING STAR MINE.

CALIFORNIA.

An old and idle mine, in the Mogul district, north of Markleeville, Alpine county, California, showing ores assaying up to 17% copper, 49 oz. silver and \$32 gold per ton.

MORNING STAR MINING CO.

ARIZONA.

Letter returned unclaimed from former mine office, Dewey, Arizona.

MORONG MINE.

VIRGINIA.

Mine office: Virgilina, Halifax Co., Va.

MORRIS MINING CO.

WYOMING.

Office: Morris, Ills. Letter returned unclaimed from former mine office, Battle, Carbon Co., Wyo. F. H. Mattison, president; J. R. Collins, vice-president; G. A. Leach, secretary; A. Hollenbeck, treasurer; J. T. Brown, general manager. Lands, sundry claims, on Nellie Creek, 1 mile below Battle, adjoining the Continental Copper Mining Co. Is tunnelling to strike a 7' vein, giving assays of 5% copper in a 50' shaft.

MORRISON MINES, LTD.

BRITISH COLUMBIA.

Absorbed, 1904, by Montreal & Boston Consolidated M. & S. Co.

MOSCOW MINE.

UTAH.

Office: care of Matthew Cullen, owner and manager, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Daniel Ferguson, superintendent. Mine, 15 miles northwest of Milford, was shipping weekly, at end of 1905, one to two cars of silver-lead and gold-copper ores, said to average about \$1,000 per car in gross values.

MOTHERLODE COPPER MINING CO.

VIRGINIA.

Office: 18 Broadway, New York. Mine office: Virgilina, Halifax Co., Va.

MOUNT AETNA GOLD & COPPER MINING CO.

UTAH.

Lands, supposedly in Utah. Presumably idle.

MOUNTAIN COPPER CO., LTD.

CALIFORNIA.

Offices: 3, Lombard St., London, E. C., Eng. American agency: 60 Beaver St., New York. Mine office: Keswick, Shasta Co., Cal. Works office: Martinez, Contra Costa Co., Cal. Wm. Keswick, chairman; preceding officer, Sir Andrew Noble, Bart., Walter Scott, C. W. Fielding, A. Fellows and H. J. Wenham, directors; A. Frewer, secretary; Lewis T. Wright, general manager; W. F. Kett, assistant general manager; T. J. Jones, mine superintendent; J. A. Black, smelter superintendent; J. J. Murray, assistant smelter superintendent; W. Cole, railway superintendent; C. C. Jones, engineer.

Organized May 10, 1902, (as reconstruction of company of same name, organized December, 1896.) with capitalization £250,000, shares £1 par. Debenture stock, £750,000, par £3, remainder of £1,000,000 issued, at 6%. All available funds are to be applied to redemption, pro rata, until £750,000 of the debenture stock shall have been paid off, after which the remaining £250,000 will be exchanged, at par, for shares or partly for shares and partly for cash; £1 per bond was repaid Jan. 16, 1905, Last dividend was 10s.,

in 1901, and largest dividend was 20s., in 1899. Net earnings for 1905 were £158,168—a remarkably good showing, considering the disadvantages under which the company labored.

The mine, 10 miles northwest of Redding, near the top of Iron Mountain, was worked originally, in a small way, for the gold and silver in the gossan capping. Landed holdings are extensive, and in addition to the old mine there is a large sulphide ore body to the north, known as the Hornet, carrying circa 6,000,000 tons of low-grade ore. The main ore body is a solid, pyritic mass, approximately 100' to 400' wide, 800' long and 500' deep, with a gossan capping of 100' to 300' width. The ore gives average returns of 5% to 5.5% copper, about 2 oz. silver and slightly under \$1 gold per ton, and is mainly chalcopyrite, associated with pyrite and pyrrhotite, occurring in a shear zone in meta-rhyolite. The mine is worked by pillar-and-stall, and depleted stopes are filled with rock, quarried just west of the mine. As much ore is left in the pillars, the mine undoubtedly will be robbed, eventually, by open-pit work. Ore reserves are estimated at about 500,000 tons, and extensive diamond drill borings have failed to show further deposits of high-grade ore. As the ore is strongly pyritic, there has been considerable trouble from mine fires, but every precaution is taken to prevent these, and to extinguish such as occur, through spontaneous combustion. The Hornet ore carries only 2% to 2.5% copper, but is rich in sulphur, which runs 47% to 50%. The mine and smelter are connected by an 11-mile narrow-gauge electric railway, traversing a rugged country, and having an average grade of nearly 2%, the elevation gained being circa 2,000'.

The Keswick Smelting Works, 8 miles from the mine, are in the cañon of Spring Creek, less than a mile from the Sacramento river, and have both broad and narrow-gauge railway lines, connecting with the Southern Pacific railroad. The smelter has 5 water-jacket blast-furnaces, of 390 tons daily capacity each, with 11 Wright circular calcining furnaces, 3 stands of converters, with 9 Parrott shells, 3 briquetting machines and a complete sampling plant. Ore is heap-roasted in open air, 8 to 10 weeks being required for roasting, the raw ore carrying 45% sulphur and the roasted ore 7%, a steam-shovel loading ores from the roast-heaps. The fines and ore from the roast-heaps are calcined in the Wright turret roasters, and briquetted by three machines, which also handle flue-dust and calcined granulated matte, using lime for a binder. The furnaces have settlers, with slag overflow to ladle cars, and a slag railway, the matte pouring into iron casting moulds on a slow-moving belt-conveyor, and passing under jets of water to chill the pigs, which are dumped into barrows and hoisted to the charging floor. The first-fusion matte is of 25% to 30% copper tenor, and the second-fusion matte is roasted and blown up to white metal, running into settlers and thence in ladles by travelling crane to the converters. The blast-furnaces have rotary blowers, driven by one Allis-Chalmers cross-compound, one Risdon cross-compound and a small auxiliary straight-line engine, steam being furnished by 3 Babcock & Wilcox boilers and 1 Heine water-tube boiler, all fired with oil. Air from the blowers is heated by stoves fired with oil, before entering the tu-

veres, the hot blast effecting great economies and giving a close approach to ideal pyritic smelting, with a very small consumption of coke in the furnaces. The converter plant has an air-compressor driven by a 500-h. p. Allis-Chalmers engine, and the 3 stands are controlled hydraulically, from a single elevated platform. Linings for the shells are tamped by a power drill, ingeniously fitted with a special tamping-iron, bolted into the chuck. Fumes from furnaces, converters and roasters, are carried through dust-chambers, and flue-dust is briquetted and resmelted. In connection with the smelting plant are large machine shops, a foundry and smithy. Electric power, generated 80 miles distant, is used at a cost of $\frac{3}{4}$ of one cent per h. p.-hour. The smelter also does custom work, buying gold ores of all grades, used for fluxing the company's own ores. Considerable cement copper is secured, by precipitation from the charged waters of the mine. Operation of the smelter has been greatly hampered by suits of neighboring ranchers, and other professional followers of agriculture and litigation. Eventually the United States Circuit Court of Appeals decided, early in 1906, for the company, which is permitted again to operate its smelter at Keswick, after nearly a year's idleness.

For the treatment of the low-grade Hornet ores, special works were required, and these have been built at Martinez, on San Francisco Bay. The works and business of the San Francisco Chemical Co. were taken over, as the nucleus of the new plant, which is one of the best planned and most extensive acid works in existence, having cost approximately \$1,000,000. The plant has a daily capacity of 350 tons, and was put in commission early in 1906. The Hornet ores, which are low in copper, but rich in sulphur, are burned, and the sulphur fumes collected in lead-lined chambers and transformed into sulphuric acid, the cinder remaining after the roasting being leached for its copper content. The acid will be sold crude, to some extent, but the bulk of the production is to be used as the basis of commercial fertilizers, for which there is an enormous demand in the rich fruit and agricultural districts of California and the other Pacific coast states. In addition to the acid plant, the Martinez works will do some general smelting, and will treat Tonopah ores, among others.

Production 1905, was circa 10,000,00 lbs. fine copper only, as compared with nearly twice that amount two years previously, and a high-water record of almost four times as great an output in a single year. The Mountain Copper Co., Ltd., seems to have been followed by an avenging deity, for five years past. Almost every misfortune that could befall a mine has befallen the Mountain, the list of troubles including mine fires, labor troubles, and litigation. All of these have been survived, and the property is now in shape, thanks to its Martinez plant, and the favorable settlement of the litigation over smelter fumes, to make more copper and larger profits than for some years past. The management is efficient and honest, and the property, notwithstanding the partial exhaustion of its high-grade ore bodies, is one of great value.

MOUNTAIN KEY MINE.**NEW MEXICO.**

Office: care of W. C. Chandler, owner and manager, Pinos Altos, Grant Co., N. M. Is one of the oldest mines in Grant county. Has a 700' shaft, and produces auriferous and argentiferous copper sulphides. Has steam power, and owner is said to plan installing a small mill and smelter.

MOUNTAIN LAKE MINING CO.**UTAH.**

Office: Salt Lake City, Utah. J. L. Rawlins, president and general manager; E. A. Wedgwood, secretary. Organized 1896, under laws of Utah, with capitalization \$50,000, shares 10 cents par. Lands, 24 claims, area circa 400 acres, in the Big Cottonwood district of Salt Lake county, showing 2 contact veins, between diorite and limestone, said to be 100' wide and traceable 2,000', carrying bornite and chalcopyrite, giving average assay values of 2.5% copper, 2 oz. silver and \$1 gold per ton, opened by a 100' shaft and 5 tunnels, longest 1,100'. Presumably idle.

MOUNTAIN LION GOLD & COPPER CO.**MEXICO.**

Office: La Cananea, Sonora, Mexico. Organized 1905, with capitalization \$50,000, to take over sundry mining lands, of circa 400 pertenencias area, the Magdalena district of Sonora, Mexico.

MOUNTAIN VIEW COPPER CO.**OREGON.**

Dead. Sold its lands, in the Waldo district, 1903, to Vulcan Copper Co.

MOUNTAIN VIEW DEVELOPMENT CO.**ARIZONA.**

Mine office: Bisbee, Cochise Co., Ariz. Geo. Bennett, president; H. M. Woods, vice-president; W. D. Kinsey, secretary; Chas. Trotman, treasurer. Organized 1903 under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 9 claims, 3 miles northwest of Bisbee, opened by 2 shallow shafts and a tunnel. Ores carry occasional lead values, and a small test shipment gave returns of 16.74% copper and 100 oz. silver per ton.

MOUNT ANDREW MINING CO.

Office: 52 William St., New York.

MOUNT ANDREWS MINE.**ALASKA.**

Sold, 1905, to Britannia Copper Syndicate.

MOUNT BABINDA MINE.**AUSTRALIA.**

A Queensland property, that produced a little ore, 1902, dressed by hand-cobbing to 23% copper and 20 oz. silver per ton, with small gold values. Presumably idle.

MOUNT BAKER & SHUKSAN MINING CO.**WASHINGTON.**

Office: 35 Hinkley Blk., Seattle, Wash. Mine office: Maple Falls, Whatcom Co., Wash. J. Conaway, president; C. M. Walsh, secretary; Geo. B. Conaway, superintendent. Lands, sundry claims, opened by a 320' tunnel, showing ore giving good assay values in copper and gold. Has an air-compressor and 2 power drills, and is said to plan developing an available water power.

MOUNT BULGA COPPER CO.**AUSTRALIA.**

Property is sundry slightly developed copper lands, in the Orange division of New South Wales. Presumably idle.

- MOUNT CHALMERS COPPER MINES, LTD.** AUSTRALIA.
Voluntarily wound up, May 1, 1901.
- MOUNT DIAMOND COPPER CORPORATION, LTD.** AUSTRALIA.
Offices: 18, Broad Street Ave., London, E. C., Eng. E. Fewings, chairman; L. G. Brown, secretary. Lands, 240 acres, leasehold, 5 miles north-east of Wandie goldfields, South Australia, carrying a vein traceable 900' on surface, opened by a 100' shaft, showing chalcopyrite associated with iron pyrites, with quartz gangue, in a vein of 2' to 25' width, with well defined walls. Property considered promising, but company apparently moribund.
- MOUNT DONALDSON COPPER CO., LTD.** TASMANIA.
Offices: 38, Gracechurch St., London, E. C., Eng. Col. H. J. Byrne, chairman; D. B. Cotton, secretary. Organized March 28, 1899, with capitalization £150,000, shares £1 par. Lands, 159 acres, on Mt. Donaldson, Corinna, Tasmania. Idle for several years.
- MOUNT EDDY MINING & DEVELOPMENT CO.** CALIFORNIA.
Letters returned from former office, San Francisco, Cal. Lands were 14 claims, near Sisson, Siskiyou county, California.
- MOUNT FISHER PROPRIETARY CO.** AUSTRALIA.
Planned building a smelter, at last accounts. Presumably idle.
- MOUNT FLORA MINE.** AUSTRALIA.
Mine office: Mackay, Queensland, Australia. Made 17 tons of copper, in 1901. Idle.
- MOUNT FRASER COPPER MINES (N. S. W.), LTD.** AUSTRALIA.
Voluntarily wound up, June, 1902.
- MOUNT GARNET & CHILLAGOE EXPLORATION CO.** AUSTRALIA.
Dead.
- MOUNT GARNET FREEHOLD COPPER & SILVER MINING CO., LTD.** AUSTRALIA.
Company liquidated, and property taken over by bondholders.
- MOUNT GARNET RAILWAY & FREEHOLD MINES.** AUSTRALIA.
Voluntarily wound up, 1903.
- MOUNT GODDARD COPPER MINING CO.**
Office: Fresno, Cal. Moribund.
- MOUNT HOPE MINE.** AUSTRALIA.
Owned by New Mount Hope Copper Mining Co., Ltd.
- MOUNT JUKES PROPRIETARY MINING CO.** TASMANIA.
Office: care of T. L. Hood, agent, Hobart, Tasmania. Lands, sundry claims, in the Mt. Jukes field, Tasmania.
- MOUNT LYELL BLOCKS COPPER CORPORATION, LTD.** TASMANIA.
Reorganized, 1903, as Mt. Lyell Blocks Mining Co. (No Liability.)
- MOUNT LYELL BLOCKS MINING CO. (NO LIABILITY.)** TASMANIA.
Offices: 47, Queen St., Melbourne, Australia. Mine office: North Mount Lyell, Montagu Co., Tasmania. Employs 220 men. Colin Templeton, chairman; preceding officer, Alfred Tolhurst, Thos. Harvey and Alex. Campbell, directors; Thos. Rollason, secretary; Robert Ferguson, general manager. Or-

ganized March 20, 1903, under laws of Victoria, as a reconstruction of the Mount Lyell Blocks Copper Corporation, Ltd., with capitalization £300,000, shares £1 par; paid, in 19s. 9d. Half yearly meetings, February and August.

Lands, 70 acres, held under mineral lease, also 60 acres timber lands and 150 acres miscellaneous lands, including a millsite, giving total holdings of 288 acres, in the North Mount Lyell district, in addition to which the company has the right to mine, for 7 years, on adjoining lands of the Mount Lyell Consols, on a royalty of 40% of net profits. The property shows sulphide ores, giving assays up to 6%, occurring in a 30' bed of conglomerate rock, but this ore body is not being worked at present. Two ore bodies now under development carry native copper, in argillaceous schists, locally termed clays, as the schists are very soft. These ore bodies were estimated to carry 3% copper, but revised figures by the company give average values of 2.15% copper. Development is by the 240' Balance shaft and the 450' Main shaft, also by the 1,638' Consols tunnel and 1,680' Office tunnel, these openings being estimated to show 100,000 long tons of ore. The ground is very soft, turning to clay when weathered, and is exceedingly treacherous, requiring heavy timbering and constant watchfulness. The copper is carried in minute particles, disseminated quite evenly through the schist, and is concentrated quite easily. During 1905 the policy of the mine was changed, in some important particulars, and work is now done on contract, as far as possible, this giving cheaper mining costs. The heavy cost of timbering also has been reduced somewhat.

The concentrator, of 350 tons daily capacity, begun work August, 1904, and gave very unsatisfactory results at first, but some minor changes have resulted in bringing the mill to a much higher state of efficiency. The mill, of steel frame, has 10 gravity stamps, 20 Wilfley and Phoenix-Weir tables, canvas tables and 12 Frue vanners. Miscellaneous improvements at the mine include a small sawmill and framing-mill for mine timbers. The Mount Lyell & North Mount Lyell Railway is distant 1 to 5 miles from the mine. Fuel is cordwood, costing 10s. per cord.

The first half of 1905 showed a working profit of £651 11s. 11d. which would have been much larger but for the caving in of the mine. At the end of 1905 the mill was treating circa 1,000 tons ore weekly, and producing 15 to 20 tons of fine copper therefrom. The management plans bringing the mill to its full capacity, of about 2,000 tons weekly, during 1906, and on that basis should produce circa 200 long tons fine copper monthly.

MOUNT LYELL-COMSTOCK COPPER CO., LTD.

TASMANIA.

Title changed, 1903, to Lyell Comstock Consolidated Copper Co., Ltd.

MOUNT LYELL CONSOLS. (NO LIABILITY).

TASMANIA.

Offices: Equitable Bldg., Collins St., Melbourne, Australia. N. Madden, secretary; H. S. Muir, mine manager; D. J. Mackay & Co., 138, Leadenhall St., London, E. C., Eng., British agents. Capitalization, £126,000. Lands, 50 acres on Mt. Lyell and 40 acres on Mt. Darwin. Latter tract has been prospected, and former is under a 7-year lease to Mt. Lyell Blocks Mining Co., on royalty of 40% of net profits secured.

MOUNT LYELL COPPER ESTATES, LTD.**TASMANIA.**

Offices: 85, Gracechurch St., London, E. C., Eng. Mylius Cohen, chairman; F. W. Eccardt, secretary. Organized July 19, 1899, with capitalization £150,000, shares £1 par; issued, £103,435. Lands, 4 leases, on Mt. Lyell, have been abandoned. Moribund and liquidation probable.

MOUNT LEYLL EXTENDED CO. (NO LIABILITY).**TASMANIA.**

Offices: 138, Leadenhall St., London, E. C., England, and Equitable Bldgs., Collins St., Melbourne, Australia. M. Gilmore, mine manager; J. P. Madden, secretary in Melbourne; H. M. Taylor, secretary in London. Capitalization £150,000. Lands, 30 acres on Mt. Lyell and 80 acres on Mt. Darwin. Idle and apparently moribund.

MOUNT LYELL MINING & RAILWAY CO., LTD.**TASMANIA.**

Offices: 39, Queen St., Melbourne, Australia, and Palmerston House, Old Broad St., London, E. C., Eng. General manager's office: Queenstown, Tasmania. Mine office: Gormanston, Montagu Co., Tasmania. On Jan. 1, 1906, employed 2,094 men. Has two boards of directors. Bowes Kelly chairman; Wm. Knox, M. P., vice-chairman; preceding officers, Wm. Jamieson, J. C. Syme and Lindsley Tulloch, members of Australian board; John Ball Ball, chairman; Sir John A. Cockburn, vice-chairman; D. J. Mackay, A. Williamson and J. Dowling, members of London board; Alfred Mellor, secretary at Melbourne; Edwin Habben, secretary at London; Robert C. Sticht, general manager; A. Lewis Dean, chief metallurgist; W. H. Wesley, assistant metallurgist; E. Carus Driffeld, railway superintendent; W. T. Batchelor, mine superintendent; A. N. Macnicol, chief mechanical engineer; P. A. Mackay, superintendent of chemical works; Dr. F. J. Howell, distributing superintendent; A. G. S. Williams and Thomas Woodward, auditors.

Organized Aug. 11, 1903, under laws of Victoria, as an amalgamation of an old company of the same name and the North Mount Lyell Copper Co., Ltd., with capitalization £1,300,000, shares £1 par; issued, £1,200,000. Debentures, £140,000, at 5%. Dividends were £150,000 in 1904 and £205,000 in 1905, and present company and its predecessor have paid total dividends, to end of 1905, of £1,351,574. Half yearly meeting, May; annual meeting, November.

Lands, 3 consolidated leases and 33 ordinary leases, from the crown, for 20-year and 30-year periods, area 1,537 acres mining lands, also 565 acres smelter-sites, with total landed holdings of 2,102 acres, in the West Coast mining district of Tasmania. Country rocks are schist, conglomerate, quartzite and sandstone, ore bodies occurring as massive lenses in the schist, near conglomerate contacts, the lenses having a generally NW. and SE. trend. There are 15 known lenses, of which 6 are under development, these having average dimensions, at the Mt. Lyell mine, of 270' width, 660' length and a proven depth of 730', and at the North Mt. Lyell mine, 100' width, 180' length and 600' proven length. Ores are of two varieties, the Mt. Leyll ores consisting of massive pyrite carrying disseminated bornite and chalcopyrite, with average values of 2.18% copper, 1.85 oz. silver and 0.055 oz. gold per long ton, while the North Mt. Lyell mine carries silicious sulphide ores, including

chalcocite, bornite and chalcopyrite, with quartzose schist gangue. There are occasional occurrences of native copper and tetrahedrite, but the ores of commercial importance are almost exclusively sulphide. In addition to the ores previously enumerated, the Mt. Lyell has large bodies of very low-grade sulphide ores, averaging circa 0.65% copper, 2 cwt. silver and 0.0725 oz. gold per ton, which doubtless will become valuable in time. The North Mt. Lyell ores are higher in copper tenor than those of the main mines, but are decidedly refractory, unless heavily fluxed, carrying 15% to 20% alumina and 60% to 75% silica. An average analysis of ores, made circa 1903, gave, in addition to copper, silver and gold contents, 40.3% iron, 46.5% sulphur, 4.4% silica, 2.5% barium sulphate and 2% alumina.

The Mt. Lyell has a 260' blind shaft, and tunnels of 320' and 1,450', while the North Mt. Lyell has blind shafts of 550' and 325', with tunnels of 850' and 780'. The mines have a total of circa 15 miles of underground workings, estimated to show 4,500,000 long tons of ore, with 1,500,000 long tons of ore blocked out for stoping in the Mt. Lyell and North Mt. Lyell mines, with about 350,000 tons blocked out in various other mines. Mining is done open-cast, in terraces, at the Mt. Lyell and its principal subsidiary mines, underground extraction, at these properties, being confined largely to the removal of the richer patches of ground encountered during exploitation. A traveling crane, at the open-cast mines, assists in extraction, and is a utilization of a valuable invention that might be employed elsewhere to advantage, where steam-shovels are not used. The overburden of the Mt. Lyell main orebody is estimated at 1,500,000 cubic yards, all of which must be stripped, eventually. The mine is lighted by electricity and 2 diamond drills are used steadily, in probing the ground. The North Lyell ores are much richer, and show considerable ore remaining that averages better than 10% copper, the North Lyell furnishing circa 25% of the total ore production, this ore being the richest in Tasmania, but refractory in smelting, unless blended with the basic ores of the Mt. Lyell. Recent developments at the North Mt. Lyell are of a very encouraging nature, where an important new ore body was discovered, 1905, on the 700' level.

The mining equipment includes 4 underground hoists, at various blind shafts, of 30-h. p. to 40-h. p. each, good for 800' depth, two Corliss cross-compound air-compressors, of 40 drills aggregate capacity, and 34 power drills. Buildings include 13 smithies, of various sizes, a 40x50' machine shop, 17x30' carpenter shop, boiler and compressor-house, engine-house, warehouse, office, locomotive roundhouse and numerous dwellings for employees. The company also owns and operates three sawmills, at various points, for the preparation of mine timber, and lumber for general building purposes. In addition to the ore mines there are extensive silica and limestone quarries, with a crushing plant, near the reduction works.

The Mt. Lyell mine was discovered 1883, and the gossan was worked in a small way, as a gold mine, until taken over by the predecessor of the present company, in 1892. The North Lyell mine was developed in 1897.

Owing to the extraction of ore mainly by tunnel and from quarries, the power plant at the mine is small, having only 300 indicated horse power.

The main power plant, at the smelter, transmits power electrically to the mine. The plant has a steaming capacity of 2,700 h. p., of which 1,200 h. p. is transformed into electricity, the plant including two Brown Boveri Parsons steam turbines, direct-connected to 400-kw. electric generators, replacing a smaller electric installation. A complete electric light system is maintained. Fuel is mainly cordwood, costing 8s. to 11s. per long ton, with a little soft coal costing 27s. per ton, and coke costing 30s. per ton. Yearly consumption of fuel is 67,500 tons of firewood, 42,200 cords of cordwood, 2,500 tons of bituminous coal and 10,000 tons of coke. The company owns a coking plant, at Port Kembla, New South Wales, this having 62 funnel-shaped ovens, doing a general commercial business, in addition to supplying the company's requirements.

The smelting plant is at Queenstown, on the Queen river, $1\frac{1}{4}$ miles from the mines, receiving ore by aerial tramway and counterbalance inclines surmounting the intervening hills, the aerial tramway being of 1,500 long tons daily capacity. The smelter is in two separate sections, smelter No. 1 having five water-jacket blast-furnaces, 40x168" at the tuyeres, while No. 2 smelter has six 42x127" water-jacket blast-furnaces, 20' in height, over all, all furnaces having cast-iron water-jackets. The capacity of the large furnaces in No. 2 plant is about 350 tons daily, 4 furnaces being in blast regularly. The furnaces use a 3-lb. blast, supplied by nine No. 8 Root blowers and three No. 7 Root blowers, each driven by a 12x22x18" direct-connected compound condensing vertical engine. Blast is heated by 8 hot-blast stoves, of the hanging U-pipe type. Pyritic smelting is employed for the first fusion, which gives a 15% matte, showing a concentration of six into one, with slags carrying circa 46% iron and 38% silica, and only 0.3% copper. The low-grade first-fusion matte is blown up, without previous calcining, in a small hot-blast furnace, using only a 5% coke charge, the consumption of coke averaging only 1% for the entire metal-bearing material treated. The 75-ton converter plant has two remelting furnaces, 6 stands and fourteen 60x96" shells of Stalman type, blast being furnished by two 16x24x30" compound condensing air-compressors. Product is blister copper averaging 98.83% copper, 100 oz. silver and 3.21 oz. gold per long ton. The smelting plant also treats custom ores. The power plant at the smelter has twelve 125-h. p. Babcock & Wilcox boilers and 16 multitubular boilers, with a Green fuel economizer, induced draft, and superheaters, the joint use of which effects a saving of 31% in fuel costs.

The 250-ton North Lyell smelter, 28 miles from the mine, is 75x210' in size, with four 16x32' reverberatory furnaces, 4 blast furnaces and a converter plant. The North Lyell works also have a 69x72' sampling mill, 41x66' boiler-house with three 250-h. p. Stirling water-tube boilers, and a 60x100' power-house with 200-kw. generators and cross-compound blowers. This plant is idle, and likely to remain out of commission permanently. A little cement copper is secured by leaching the mine water.

The company has two private railroad systems, of 31 and 38 miles, respectively, also a 24" gauge line, with 6 locomotives, connecting the mines, gux quarries, smelters, warehouses and yards. The 31-mile line of 42" gauge

runs from the smelter at Queenstown to the seaport of Strahan, with extensive wharves on Macquarie Harbor, connecting at the latter point with the Strahan-Zeehan government line, giving rail connections with all parts of the colony. The Queenstown-Strahan line traverses an exceedingly difficult country, $4\frac{1}{2}$ miles of this line having gradients of 1 in 20 and 1 in 16, employing 4 special Abt type locomotives and centre-rack railway, in addition to ordinary adhesion engines. The company's private lines have 238 cars, and do a good general business, in addition to handling the company's traffic.

Miscellaneous enterprises include a complete machine shop, iron foundry, brass foundry, brickyard and three sawmills.

A chemical and fertilizer plant was completed, 1905, at Yarraville, a suburb of Melbourne, Australia. The works include an acid plant, making sulphuric acid from low-grade cupriferous pyrites from the Mt. Lyell mine. Guano rock is secured from Ocean Island, in the Pacific, and the product is superphosphates of the highest grade, for which there is a large demand in the Australian commonwealth.

The cost-sheet of the company makes an excellent showing. Cost of mining, including ores secured open-cast and underground, averages 5s. per ton, a decrease of about 6d. per ton from 1904, ore secured by quarrying costing approximately one-third as much as underground ore from the North Mt. Lyell. Smelting costs, including ore transportation, are 6s. 5d. per long ton, giving total average mining and smelting costs of only 11s. 5d. per long ton, a decrease of 2s. 2d. from the already low costs of 1904. These costs spell efficiency, and not only reflect credit upon Mr. Sticht, as the responsible manager, but indicate the existence of a well-organized and thoroughly efficient and loyal staff.

Production, 1904, was 18,513,600 lbs. fine copper, 816,643 oz. silver and 23,392 oz. gold, and for 1905 was 18,592,000 lbs. fine copper, with presumably about the same gold and silver values as in the preceding year. The Mt. Lyell has not been an easy property to handle, presenting a series of financial, mining and metallurgical problems, all of which have been solved satisfactorily. There are no dark corners in the company's office, mines, or works, and the shareholders may congratulate themselves upon possessing interests in a good mine, well managed.

MOUNT LYELL NORTH CO.

TASMANIA.

Offices: 153, Leadenhall St., London, E. C., Eng. Moribund.

MOUNT LYELL PROPRIETARY MINES, LTD.

TASMANIA.

Voluntarily wound up, June, 1901.

MOUNT LYELL SOUTH CO.

TASMANIA.

Offices: 153, Leadenhall St., London, E. C., Eng. A Siamese twin of the Mt. Lyell North, and also moribund.

MOUNT LYELL TASMAN COMSTOCK GOLD, SILVER, LEAD & COPPER MINING CO., LTD.

TASMANIA.

Offices: Launceston, Tasmania. Mine office: Mt. Lyell, Montagu Co., Tasmania. C. H. F. Shern, agent; F. H. Mitchell, mine manager. Idle.

MOUNT MOLLOY MINE.**AUSTRALIA.**

Mine office: Herberton, Queensland, Australia. Lands are circa 20 miles from the coast. Mine has been worked intermittently, under lease, for some years, largest production, 1902, being 1,200 tons of ore, of 20% to 25% copper tenor. Mine is 230' deep, showing at the bottom a 17' vein carrying a 5' pay-streak of high-grade sulphide ore, and about 12' feet of cupriferous iron pyrites. Property is considered promising, if given adequate development and equipment.

MOUNT MORGAN COPPER CO.**AUSTRALIA.**

Reorganized as Moonmerra Copper Mining Co., Ltd.

MOUNT MORGAN GOLD MINING CO., LTD.**AUSTRALIA.**

Offices: 9, Gracechurch St., London, E. C., Eng., and 118, Pitt St., Sydney, Australia. Mine office: Rockhampton, Queensland, Australia. R. S. Archer, Australian chairman; W. K. D'Arcy, London chairman; J. Jenkins, London secretary; H. Woodd, Australian secretary; Capt. G. A. Richard, general manager; H. P. Seale, mine manager. Organized October 1, 1886, under laws of Queensland, with capitalization £1,000,000, shares £1 par. Has paid dividends annually since organization. Lands, 640 acres freehold, also 80 acres leasehold and 90 acres perpetual leasehold. This mine has been, for 20 years, one of the greatest gold producers of the world; but has shown declining values and decreasing output for several years past, due mainly to increased depth, but partially, perhaps, to the mistaken policy, followed in the past, of gouging out the richest ore.

Developments at depth, and extensive tests by diamond drill borings prove the immense ore body of the mine to become base at depth, and to carry greatly increased copper values, coincident with decreased gold values, hence arrangements have been made for the production of copper upon a large scale. Ore reserves of May, 1905, were estimated, conservatively, at 1,665,000 long tons blocked out, with 1,135,000 tons additional, assumed as reasonably certain to exist, ore being about equally divided between first-grade ore, averaging 3.5% copper and 8 dwts. gold per long ton, and second-grade ore, averaging 3% copper and 2.5 dwts. gold per long ton.

The new reduction plant for treating copper ores, being built at an estimated cost of £220,000, with an estimated capacity of 400 tons daily, should be in operation during 1906. Production of copper, secured as a by-product, has averaged 250,000 lbs. annually, for some years past, and amounted to 257,600 lbs. fine copper, for the fiscal year ending May 31, 1905. Assuming an average extraction of 2.5% copper, from an average of 10,000 long tons of ore monthly, which assumptions seems fully warranted by the extensive tests, the size of the new plant under construction, and the financial strength of the company, the output of copper of the Mount Morgan, for the year 1907, should be circa 6,750,000 pounds, and perhaps larger. In any case the Mount Morgan will become, during 1907, an important producer of copper, ranking third among Australian mines in output, with a prospect of taking even higher place, eventually.

**MOUNT PERRY COPPER & REID'S CREEK
GOLD MINES & SMELTING CO., LTD.**

AUSTRALIA.

Voluntarily wound up, June, 1902.

MOUNT PITTON MINE.

AUSTRALIA.

Mine office: Mt. Pitton, South Australia. T. W. Styles, manager. Has steam power.

MOUNT PLEASANT MINE.

AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. Is a small producer, working pockets of chalcocite, chalcopyrite and carbonates, ores being sent to the Cobar smelter for reduction.

MOUNT READ MINING CO., LTD.

TASMANIA.

Offices Worcester House, Walbrook, London, E. C., England, and Cooks's Chambers, Elizabeth St., Hobart, Tasmania. H. G. Campion, chairman; N. M. Ogle, secretary in London; J. Hickson, secretary in Tasmania; Stafford Bird, manager. Organized Nov. 4, 1901, with capitalization £150,000, shares £1 par. Lands, 80 acres, carrying gold, silver, lead and zinc ores, assaying about 0.5% copper, also 121 acres mill and smelter sites, carrying water-rights. Development is by tunnel, with considerable ore developed, but no feasible process of treatment has been devised, the ores being very difficult of reduction and separation.

MOUNT ROSE MINE.

AUSTRALIA.

Mine office: Wallaroo, South Australia. J. Renfrey, manager. Has steam power and employed about 20 men, at last accounts.

MOUNT ROYAL MINE.

AUSTRALIA.

Mine office: Dandaloo, New South Wales, Australia. Property is circa 20 miles west of Dandaloo, with about 500' of development, showing a considerable body of oxide and carbonate ores and chalcocite, assaying up to 30% and 40% copper.

MOUNT ST. HELENS CONSOLIDATED MINING CO.

WASHINGTON.

Office: 606 Marquam Bldg., Portland, Ore. Mine office: Spirit Lake, Skamania Co., Wash. Employs 10 to 60 men. Thos. Prince, president; Chas. H. Marsh, secretary; Dr. Henry Waldo Coe, treasurer and managing director; Andrew Olson, superintendent. Organized 1902, under laws of Oregon, with capitalization \$1,800,000, shares \$1 par.

Lands, 106 claims, partly patented, area 2,100 acres, also a 40-acre mill-site, estimated to carry 100,000,000' of standing timber, in the St. Helens district, circa 50 miles from Portland, on the north fork of the Toutle river and on the shores of Spirit Lake. Lands include former holdings of the Sweden Copper Co., Cascadia Mining & Development Co., Calumet Copper Mining Co., Bronze Monarch Mining Co. and Cascade Copper Mining Co., giving a tract practically a parallelogram of 1½ miles width by 5 miles length. In addition to copper mines, the tract contains a granite quarry, sundry gold veins, ochre beds and a deposit of pumice stone. Country rocks are syenite, diorite and slate, carrying sundry fissure veins and contact veins between diorite and syenite. The property shows numerous veins, of which about 20 have been more or less developed, these ranging 5' to 100' in width, showing mainly

sulphide ores, including chalcocite, bornite and chalcopyrite, giving assays of 2% to 25% copper, occasional small lead values, 2 oz. to 50 oz. silver and \$1 to \$40 gold per ton, the usual oxidized ores being absent. Development is almost exclusively by tunnels, there being but one shaft, and that of only 50' depth. The main tunnels are 250', 400', 600' and 2,300' in length, with total underground openings of 5,500', estimated to show 125,000 tons of medium and high grade ore, with low grade ore of much greater tonnage.

The Sweden-Norway-Denmark group carries a 30' to 40' vein, between diorite and syenite, with mineralization mainly on the footwall, showing frequent chutes of rich ore averaging about 9% copper, 6 oz. silver and \$3.25 gold per ton.

The Polar Star mine is said to show 2' to 5' of ore assaying 10% to 30% copper, 8 oz. to 70 oz. silver and \$3 to \$11 gold per ton.

The Minnie Lee group, 4 miles from the Polar Star, has about 500' of workings, showing auriferous and argentiferous copper ore of concentrating grade.

The Earl group shows an immense gossan outcrop, carrying small gold values, with occasional bunches of high-grade copper ore, the gossan overlying a breccia.

The Bronze Monarch group, opened by a 300' tunnel, adjoins the Sweden group, and has produced circa 1,000 tons of sulphide ore, carrying good values in copper, silver and gold.

The Index mine, circa 2½ miles from the main group, shows a vein of 44' estimated average width, carrying ore of only 1.5% copper tenor, with about 8 oz. silver and \$4 gold per ton.

Equipment includes an 80-h. p. Pelton water-wheel, 6-drill Sullivan air-compressor, 3 power drills, a sawmill and about 25 shops and cabins at the various camps. Surveys have been made for a loop railroad line of 140 miles, running from Portland around Mount St. Helens and return. Company plans further development during 1906. Management is considered good, and property is favorably regarded.

MOUNT SHASTA GOLD MINES CORPORATION.

CALIFORNIA.

An unsavory concern, succeeded, 1904, by Phoenix Gold Mining Co.

MOUNTS SICKER & BRENTON MINES, LTD.

BRITISH COLUMBIA.

Mine office: Mount Sicker, Vancouver Island, B. C. W. A. Dier, managing director and superintendent. Lands, 9 claims, area 352 acres, 49 miles north of Victoria, in two groups, known as the Copper Canyon group of 5 claims on Mount Sicker, and a group of 4 claims on Mount Brenton. Property is in the same geological horizon as the Tyee and Lenora mines, and carries a continuation of the schistose ore formation of those mines. A two-compartment shaft, sunk 144', at an angle of 76°, shows a little good ore in the bottom, values apparently improving with depth. Considerable development work, done at different times, on various claims, has given encouragement, but the company has not yet secured a workable ore body. Management is said to plan the installation of a larger power plant, tram and concentrator.

MOUNT STANLEY MINING CO.

ARIZONA.

Letter returned unclaimed from former mine office, Globe Gila Co.,

Ariz. Organized 1905, with capitalization \$1,000,000, shares \$1 par, to operate sundry claims lying southwest of Globe.

MOUNT STERLING MINE.**CALIFORNIA.**

Owned by Kneiper & Ashbrook. Lands are in Section 10, T. 12 S., R. 23 E., Fresno county, California. Idle.

MOUNT THECKLA MINE.**AUSTRALIA.**

Absorbed by Kangaroo Hills Mining & Smelting Co.

MOUNT UNION CONSOLIDATED MINING CO.**ARIZONA.**

Office: Germania Bldg., St. Paul, Minn. Mine office: Prescott, Yavapai Co., Ariz. R. H. Green, president; W. H. Fagley, vice-president; H. M. Temple, secretary; J. E. Whalen, general manager. Organized 1904, under laws of Arizona, with capitalization \$3,600,000, shares \$1 par, as successor of Mount Union Mining Co., and Arizona-Michigan Mining Co. Lands, 19 claims, in Cook Cañon, Hassayampa district, on the southwestern slope of Mount Union, Senator range, Bradshaw Mountains, circa 14 miles south of Prescott. The Arizona-Michigan mine, 9 claims, having a 175' shaft, with circa 1,000' of workings, shows a vein of 3' to 6' width, with a 12" paystreak of argentiferous and auriferous copper and galena, of high grade. Mine also has a 460' shaft and a small mill. Management plans replacing steam by electric power, and shipping concentrates to the Humboldt smelter.

MOUNT UNION MINING CO.**ARIZONA.**

Merged, 1904, in Mount Union Consolidated Mining Co.

MOUNT WASHINGTON COPPER CO.**MARYLAND.**

Dead. Property sold under foreclosure, March, 1903.

MOUNT WHIPPLE MINING CO.**CALIFORNIA.**

Said to have mining property in vicinity of Empire Flats, on the Colorado river, near the Bill Williams Fork river.

MOUNT ZIRKEL COPPER MINING CO.**COLORADO.**

Office: 240 La Salle St., Chicago, Ills. Mine office: Pearl, Larimer Co., Colo. Wm. A. McGuire, president; E. B. Boisot, secretary and treasurer. Organized 1901, under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, area 60 acres, also a 5-acre millsite, in the Big Horn district, showing a 75' fissure vein, claimed by company to average 20% copper, 4 oz. silver and \$10 gold per ton, which is too good to be true, opened by a 250' shaft. Has steam power. Idle for several years.

MOURGOUL RIVER COPPER CO., LTD.**RUSSIA.**

Offices: 3, Princes St., London, E. C., Eng. E. Fairweather, secretary. Capitalization, £500,000. Was organized to take over sundry copper and silver-lead mines, in the Mourgoul division of the Artois district of the Russian Caucasus, but secretary writes, Feb. 25, 1905, that company had not yet acquired its property. Apparently abortive.

SOCIÉTÉ ANONYME DE MOUZALA.**ALGERIA.**

Offices: 5, Rue St. Vincent-de-Paul, Paris, Xe., France. Mine office: Campdes Chenes, par Blida, department d'Alger, Algeria. E. Raschlé, president; R. Lava, secretary; M. Duvalard, general manager. Organized 1891, with capitalization 350,000 fr. Lands, 5,362 hectares, showing 6 fissure veins,

in schists, carrying chalcopyrite, and 10 contact veins carrying antimonial gray copper, veins ranging from 2cm. to 1m. wide and averaging 4% to 5% copper, and from nothing to 27 oz. silver per ton. Mine is opened by a 17m. shaft and 7 tunnels of 39m. to 63m. length, in chalcopyrite, and by 12 tunnels, four longest 220m., 240m., 255m. and 265m., in gray copper ore. Mine is served by the West Algerian railroad, 2km. distant. Copper properties have been idle since 1899, but the company has developed large bodies of hematite and spathic iron, estimated to contain 4,200,000 tons of ore of merchantable grade.

MOZUMI MINE.**JAPAN.**

Owned by the Mitsu Bishi Goshi-Kwaisha.

MULOCK TRACT.**MICHIGAN.**

Office: care of R. P. Mulock, owner, Colfax, Ia. John F. Dreiss, superintendent. Lands, 160 acres, being the Northwest $\frac{1}{4}$ of Section 9, Town 49 North, Range 41 West, near the Norwich mine, Ontonagon county, Michigan. Exploratory work, 1903-1905, has shown 2 amygdaloidal beds, outcropping at a distance of about 400' apart, with average widths of circa 6' and 15', opened by several pits, showing copper.

MULTNOMAH MINING & MILLING CO.**WASHINGTON.**

Mine office: Nespeler, Okanogan Co., Wash. Has a tunnel showing ore, carrying good assay values in gold, silver and copper. Presumably idle.

MUNGANA (CHILLAGOE) MINING CO., LTD.**AUSTRALIA.**

Offices: 39, Queen St., Melbourne, Australia, and Palmerston House, Old Broad St., London, E. C., Eng. Mine office: Mungana, Lynd Co., Queensland, Australia. Employs 200 men. Harvey Patterson, chairman; V. J. Saddler, vice-chairman; E. J. J. Rodda, mine manager; Fred Back, superintendent; C. L. Hewitt, secretary in Melbourne; Edwin Habben, secretary in London. Organized March 1, 1901, under Companies Acts, 1863 to 1896, of Queensland, with capitalization £125,000, shares 5s. par. For fiscal year ending June 30, 1905, gross receipts were £25,662, with net profits of £5,742, as compared with net profits of £2,689 in the previous year.

Lands, 5 claims, area 271 acres, leasehold, in the Walsh district, carrying ores of copper, lead and silver. Mines are known as the Griffiths, developed by an 80' open-cut; Calumet, opened by an 80' shaft; Magazine, worked open-cut, and having an 83' shaft; Dorothy, an old mine, opened by a 100' shaft; Lady Jane, opened by an old 100' shaft and a new 300' three-compartment shaft, and Girofla. Principal operations are at the Lady Jane and Girofla mines. No. 3 shaft, on the Girofla, has been fully equipped, and on the 150' level produces ore giving smelter returns of 18.3% copper, 16.3% lead and 34.5% silver per ton. The Girofla also has a large open-cut, stripped to a depth of 60'. The Lady Jane is proving very wet, at a depth of 200'. The old shaft was lost from a crush, and a third shaft has been sunk thereon. The water flow is circa 200,000 gallons daily. Mine is served by the Chillagoe to Maræba Railway.

Production, 1903, was 720 long tons fine copper; 220 long tons in 1904. and only 90 long tons in 1905, but was 160 long tons for the first four months

of 1906. Production of lead is normally 4 to 6 times as great, in weight, as the output of copper, and silver values are nearly as great as copper and lead combined.

SUCESION JUAN MUÑOZ.**CHILE.**

Office and mine: La Serena, Coquimbo, Chile. Has steam power and a small smelter, employing circa 200 men, at last accounts.

MUNROE-THOMPSON ORE REDUCTION CO. NOVA SCOTIA & QUEBEC.

Dead-beats, out of business. Fully described in Vol. IV.

MÜNSTER'SCHE GEWERKSCHAFT.**GERMANY.**

Office: Düsseldorf, Germany. Fr. Gessler, manager. Has iron and copper pyrites, worked in a small way, at last accounts.

MURRAY-ISABEL MINES CO.**COLORADO.**

Office and mines: care of Murray, Pavay & Seymour, owners, Parkdale, Fremont Co., Colo. E. M. Lamont, superintendent. Ores carry principal values in gold, silver and lead, with a little copper and zinc as by-products. Has steam power and concentrator, shipping concentrates direct to smelter. Employed about 20 men, at last accounts.

MURRAY MINE.**ONTARIO.**

In the vicinity of Sudbury, Algoma, Ont. Opened 1892, closed 1894, since idle. Principal values are in nickel, with some copper. Ore body, said to average 70' wide and low in grade, is a massive pyrrhotite, carrying occasional nickeliferous and cupiferous iron pyrites.

MURRIN COPPER MINES, LTD.**AUSTRALIA.**

Voluntarily wound up, March 1905.

MURTEGA MINERALS CO., LTD.**PORTUGAL.**

Offices: 8, Princes St., London, E. C., Eng. Mine office: Barrancos, Provincia de Alentejo, Portugal. J. D. Massey, chairman; H. G. Jones, secretary. Organized Dec. 8, 1900, with capitalization £80,000, shares £1 par; issued, £67,567. Lands include five old copper mines. Company endeavored to open a mine at the presumable point of intersection of 3 main veins, in the center of a hill, under a promising gossan capping, by shaft and tunnel. Idle.

MUTOOROO MINE.**AUSTRALIA.**

Office: care of J. P. Winch, Hindley St., Adelaide, South Australia. Mine office: Cockburn, New South Wales, Australia. Lands, 320 acres, leasehold, 14 miles southwest of Cockburn, showing ores in great variety, including cuprite, malachite, azurite, chrysocolla and atacamite near surface, changing in depth to chalcocite, bornite, and chalcopyrite, associated with iron pyrites. Ores occur as lenses of considerable size, near the contact of intrusive rocks, and average about 6.5% copper in treatment. Property has paid small dividends. Presumably idle.

MUTUAL COPPER CO.

Office: 100 Boylston St., Boston, Mass.

MUTUAL GOLD & COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former office, Rawlins, Wyo. De Forest Richards, president; L. E. Armstrong, secretary. Organized 1899, under

laws of Wyoming, with capitalization \$500,000, shares \$1 par. Lands, 4 claims, area 65 acres, in the Battle Lake district of Carbon county, Wyoming, showing an 8' vein, opened by a 200' tunnel.

MYSTIC SHRINE GOLD & COPPER MINING CO.

UTAH.

Dead. Lands sold to Intermountain Mining & Industrial Association.

COMPANIA METALURGICA NACIONAL.

MEXICO.

Mexican title of National Metallurgical Co.

COMPANIA MINERA LA NACIONAL.

MEXICO.

Mine office: El Salado, San Luis Potosí, Mex. Miguel Ferrara, president; José Marie Parga, manager. Company operates El Saltillito mines, producing silver, gold and copper. Has steam power and employed 150 to 200 men. at last accounts.

NACO SMELTING & REFINING CO.

ARIZONA.

Office: 522 Bradbury Bldg., Los Angeles, Cal. Works office: Naco, Cochise Co., Ariz. Robert Mitchell, president and treasurer; Robert E. Morrison, vice-president; Chas. B. Lewis, secretary; preceding officers, Henry J. Stevens and N. M. Edwards, directors. Organized under laws of Arizona, with capitalization \$500,000, shares \$10 par. Lands, 53 acres, just east of the Naco townsite, reached by the El Paso & Southwestern Railway, on which it was planned, early in 1906, to build a 250-ton custom smelter, costing circa \$75,000. Smelter will have a 250-ton Mitchell economic hot-blast furnace, similar to those at the Greene Consolidated, Copper Queen and United Verde mines. Company will be closely affiliated with the South Cananea Copper Co., of which Robert Mitchell is president. Water will be secured from artesian wells, and the smelter will have a 50-kw. electric light plant, 5-ton ice plant, etc., employing circa 150 men.

NACUZARA MINING & REDUCTION CO.

MEXICO.

Letter returned unclaimed from former office, Los Angeles, Cal. Fred Ohlmeyer, president; J. Irving McKenna, secretary. Organized July 1902, to take over a copper-gold property, 7 miles from Moctezuma, Sonora. Presumably idle.

NAFVERBERGS KOPPARVERK.

SWEDEN.

A small property, in Kopparbergs Län, Sweden. Production, 1902, was 361,800 kilograms of low-grade copper matte.

NAGAMATSU MINE.

JAPAN.

Mine office: Okura-mura, Mogami-gori, Uzen, Japan. Ore is chalcopyrite, associated with iron pyrites and a little sphalerite, in quartz gangue. Has many veins, largest ranging from 6" to 2' in width. Production, 1904, was 620,000 lbs. fine copper.

NAHMINT MINING CO.

BRITISH COLUMBIA.

Mine office: Alberni, Vancouver Island, B. C. Property is the Hayes mine, having about one mile of underground openings, and a 1-mile aerial tram. Work was suspended in 1902, when mine was said to be nearly exhausted, but later developments, at adjoining properties, were of such a nature that work was resumed in 1904. Presumably idle again.

COMPANIA MINERA DE NALTAGUA.**CHILE.**

Property is the Naltagua mine, opened 1898, in the department of Melapilla, Chile.

NAMAQUA COPPER CO., LTD.**CAPE COLONY.**

Offices: 3, Fenchurch, St., London, E. C., Eng. Mine office: Concordia, Little Namaqualand, Cape Colony. Fredk. J. Mirrieles, manager; Francis Phillips, superintendent; A. W. Outram, secretary. Organized April 23, 1888, as reconstruction of Namaqua United Copper Co., Ltd., with capitalization £200,000, shares £2 par; issued, £188,662. Has paid annual dividends of 7.5% to 40%, since organization, excepting 1891 to 1894 and 1901-1902. Paid 5% in 1903, 7.5% in 1904 and 7.5% in 1905. Lands, 680 acres leasehold, held on royalty of 2s. 6d. per ton of ore produced. Mines are the Tweetfontein, with 7 shafts; Wheal Julia, with 3 shafts; Flat and New East Centre, with one shaft each; Jubilee, Henderson and Prospect, with 2 shafts each. Has concentrating plants at the Flat and New East Centre mines, where ore is dressed up to 25% to 30% in tenor, for shipment to British smelters, via Port Nolloth. Ore is high-grade chalcopyrite, occurring with intrusive greenstone, traversing granite. Production was 12,088 tons (of 21 cwt.) ore in 1904. Production, 1905, was 5,276,712 lbs. fine copper. Property has considerable ore reserves, and is managed conservatively and ably, having a surplus fund of about £40,000, invested in British consols, and has returned profits of double its capital since organization.

NAMAQUA VENTURE SYNDICATE.**CAPE COLONY.**

Mine office: Wittwater, Little Namaqualand, Cape Colony. Was developing a new copper mine, said to be of some promise, circa 1904.

NANAIMO JUBILEE MINING &**BRITISH COLUMBIA.****DEVELOPMENT CO., LTD.**

Lands are the Delphi group of 7 claims and the Green Mountain group of 8 claims, in the Dunsmuir district of British Columbia, circa 18 miles from the Esquimault & Nanaimo railway. Property, though slightly developed, is considered promising.

NANCOT COPPER CO.**NEW MEXICO.**

Office: care of H. S. Clark, president, Southboro, Mass. Mine office: Belen, Valencia Co., N. M. Organized Oct. 1902, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par. Bonds, \$250,000 authorized, running 5 years, at 6%. Company is giving a bonus of \$2 in stock with each dollar of bonds sold. Lands, 26 claims, in the Manzana Mountains, near Belen, fairly timbered and watered, and near a projected branch line of the Santa Fé railway. Mine has a 2-compartment shaft, and at last accounts was shipping a few carloads of ore running 15% to 20% copper.

NANCY HANKS MINE.**MONTANA.**

Mine office: Garnet, Granite Co., Mont. Title is in dispute. Ores carry gold, silver and copper. Has steam power. Idle.

NANTLLE VALE COPPER MINING CO., LTD.**WALES.**

Offices: 11, Dale St., Liverpool, Eng. Mine office: Llanllyfin, Carnarvon, Wales. O. A. Harling, chairman; W. H. Hill, secretary. Organized

Sept. 9, 1900, with capitalization £5,000, shares £1 par. Issued, £4,007. Debentures, £8,500, protected by first, second and fourth mortgages. Cannot be learned that company ever has done any mining.

NAPA COUNTY COPPER MINING CO.

CALIFORNIA.

Letter returned unclaimed from former office, 1206 Market St., San Francisco, Cal. Owen Wade, president; F. J. Taylor, secretary and treasurer. Organized August 22, 1902. Lands, 13 miles south of Middletown, Napa county, California, are developed by a 400' tunnel.

NAPOLEON & MAGHERA COPPER MINING &

UTAH.

REDUCTION CO.

Office: Lock Box 537, Cedar Rapids, Iowa. Operating office: Lock Box 517, Ogden, Utah. Mine office: Utah Hot Springs, Box Elder Co., Utah. Employs 10 men. Don McGuire, president and general manager; J. H. Kincaid, vice-president; Dr. James W. Dalbey, secretary and treasurer; Daniel Convery, superintendent; preceding officers, Lee Kincaid and John Logan, directors. Organized February, 1904, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Annual meeting, third Wednesday in June. Lands, 12 claims, area 240 acres, patents pending, also a 10-acre millsite, in the Sierra Madre district, with granite country rock carrying a continuous outcrop showing mineralization for a distance of 13,800' on the company's lands. Mineralization on two ore bodies ranges 16' to 600' width, showing mainly bornite and chalcopyrite, with occasional chalcocite and copper silicates, assaying 3% to 30% copper, 2 oz. to 10 oz. silver and \$2 to \$4 gold per ton, opened by tunnels of 260' and 85', with a quarter mile of workings, estimated to show 200,000 tons of ore, with 75,000 tons blocked out for stoping. Equipment includes small shops and mine buildings. A smelter and railroad, at Utah Hot Springs, are only 2½ miles from the mine. Company plans continuous development, installation of a 4,000' aerial tram, and the building of a 300-ton concentrator. Property is regarded favorably.

NAPOLEON MINE.

CALIFORNIA.

Mine office: Copperopolis, Calaveras Co., Cal. Is the oldest copper mine in California, and once was a considerable producer. Vein channel is 100' wide and ranges from diabase to talcose schist, ore bodies occurring in lenses up to 20' wide. Ores are principally sulphide, with a fair sprinkling of carbonates and oxides. Old shaft, 325'. A new shaft has been sunk to the westward. Considerable copper has been produced, during past few years, by leaching the old dumps. Work was resumed, after a year's idleness, early in 1906.

NAPOLEON MINE.

WASHINGTON.

Mine office: Boyds, Ferry Co., Wash. Harry Johns, superintendent. Is under bond to the British Columbia Copper Co., and in 1905 was shipping 20 tons daily, of copper ore with excess of iron and sulphur, to the Greenwood smelter.

NASHVILLE MINE.

COLORADO.

Letter returned unclaimed from former mine office, Idaho Springs, Colo.

NATIONAL CAPITAL COPPER CO.

MEXICO.

Office: 1901 Seventh St., N. W., Washington, D. C. Mine office: Coaps.

Michoacán, Mex. Henry M. Baker, president and treasurer; Francis M. Criswell, secretary; Samuel W. Scott, general manager. Organized April 23, 1902, under laws of Virginia, with capitalization \$150,000, shares \$1 par. Lands, 550 pertenencias, area circa 1,375 acres, in the Tacambara district, showing 6 contact veins between granite and limestone, carrying native copper and argentiferous and auriferous oxide, carbonate and sulphide ores. Two veins are being developed by tunnels, the Confianza vein being said to be 70' wide. Nearest railway is the Mexican National, 45 miles distant. Property has ample water available, and is well timbered.

NATIONAL COPPER & GOLD MINING CO.**ARIZONA.**

Office: care of Gates M. Fowler, general manager, Phoenix, Ariz. Organized 1904, under laws of Arizona. Lands are the Rogers Springs group, in the Cave Creek district, circa 30 miles north of Phoenix, Maricopa county, Arizona, held on \$60,000 bond and lease from W. E. Marlar.

NATIONAL COPPER MINING CO.**UTAH.**

Office: 400 D. F. Walker Bldg., Salt Lake City, Utah. F. E. Smith, president; W. H. Tibbals, vice-president; C. E. Peyton, secretary and treasurer. Capitalization \$100,000, shares 10 cents par. Lands, circa 115 acres, in the La Sal Mountains, Sonoma district, Grand county, Utah. Ore assaying 9.5% copper, with traces of gold and 17.5 oz. silver per ton, has been taken from a fissure vein traversing sandstone. Idle.

NATIONAL COPPER MINING CO.**WYOMING.**

Office: Douglas, Carbon Co., Wyo. Frank Tinkham, president; G. W. Johnson, secretary; H. C. Paul, general manager. Organized July, 1902, with capitalization \$250,000. Lands, sundry claims, near Guthrie, Wyoming. Idle.

NATIONAL COPPER ORE CO.**VIRGINIA.**

Mine office: Garrisonville, Stafford Co., Va. Lands carry deposits of cupriferous iron pyrites.

NATIONAL GOLD & COPPER CO.**ARIZONA.**

Office: care of Ben Blanchard, manager, Prescott, Ariz. Lands are in Yuma county, near the Bill Williams Fork river, slightly developed by several shallow shafts.

NATIONAL GOLD & SILVER MINING CO.**NEW MEXICO.**

Mine office: Stein's Pass, Grant Co., N. M. B. L. Berkey, superintendent, at last accounts. Has steam power and a 50-ton concentrator.

NATIONAL METAL CO.**MEXICO.**

Office: 120 Liberty St., New York. Works office: Guadalajara, Jalisco, Mexico, and Ameca, Jalisco, Mexico. H. B. Lewis, general manager. Has sampling mills at Ameca and Guadalajara, and a new plant building at Nonoalco, near the City of Mexico, under the superintendency of D. C. Donney, will be the first purely lead refinery, on a modern scale, in the republic. The Nonoalco plant will have 8 furnaces and an electrolytic plant, exclusively for lead.

NATIONAL METALLURGICAL COMPANY.**MEXICO.**

Offices: 505 Equitable Bldg., Denver, Colo., and 1503 Arrott, Bldg.,

Pittsburg, Pa. Mine and works office: Matehuala, San Luis Potosí, Mexico. H. N. Nichols, president and general manager; Chas. H. Job, vice-president; John S. Gibbons, secretary; J. H. McConnell, treasurer; Nat. Turner, general superintendent; Albert L. Waters, metallurgist; A. P. Callender, general agent; Chas. L. Williams, superintendent; W. B. Watson, assistant superintendent; E. O. Dane, engineer; Grattan Foley, cashier. Organized under laws of Colorado, with capitalization \$1,000,000, shares \$25 par. Bonds, \$500,000, at 6%.

Lands, 51 claims, area 1,200 acres, also a 125-acre smelter-site and 75 acres miscellaneous lands, the mine tract including La Cobriza and adjoining mines. Country rock is limestone, altered by intrusive granite-porphry, ore bodies occurring as lenses and contact veins in an altered zone of garnetic wollastonite, ore bodies having a generally north and south strike, with a western dip of circa 45°. The company's lands carry 26 known ore bodies, of which 7 are more or less developed, these, ranging from 3' to 130' width and from 200' to 1,200' length, having been opened to a depth of 200' only. Mines have 6 shafts, including the 100' Aurora shaft, and 120' El Carmen shaft, and 20 tunnels, of 2,280' aggregate length, estimated to put 364,000 tons of ore in sight, with 171,400 tons blocked out for stoping. Ores include malachite, bornite and chalcopyrite, carrying estimated values of 4.5% copper, 6 oz. silver and \$2 gold per ton. Company has added to La Cobriza the Monte Cristo, Alpha and Beta mines. The mine has 4 stone buildings, for various uses.

The company has a smelting franchise and sundry other government concessions, and has arranged to secure a plentiful supply of water from a distance of 18 miles, and will furnish water to the city of Matehuala, in addition to supplying the smelter.

The smelter, 7 miles from the mine, has a 200-ton copper matting furnace, turning out matte with an average tenor of 50% copper, 120 oz. silver and 0.5 oz. gold per ton. The smelter was blown in, circa January 1, 1906, and does a general custom business, as well as smelting La Cobriza ores. Management plans erecting a steel furnace building, adding an electric power plant, and increasing the smelting capacity to 500 tons daily, during 1906.

The promoters of the company enjoy a good local standing, and the mines and plant seem to be operated along sound lines, under competent management, but the estimates of prospective profits, put out by the company while placing stock, are entirely too high.

NATIONAL MINING CO.

BRITISH COLUMBIA & CALIFORNIA.

Office: Tacoma, Wash. Mine office: Waldo, Ore. S. J. Pritchard, president; Geo. P. Larsen, secretary; John Sanger, superintendent. Capitalization \$10,000,000. Property is the Sanger group of 35 claims, area 700 acres, in Del Norte county, California, a few miles south of Waldo, also sundry mining claims in British Columbia. Also has oil lands in western Washington and several mining claims in the lower Arrow Lake district, British Columbia. The Sanger ores give good assay values in copper and gold, and company is said to plan construction of a smelter. Company

may be doing a legitimate business, but its advertising is of such an exaggerated nature, and capitalization is so excessive, that no conservative investor would care to have anything to do with the property.

NATIONAL MINING CO.

MICHIGAN.

Office: 15 Congress St., Boston, Mass. Mine office: Rockland, Ontonagon Co., Mich. John C. Watson, president; Daniel L. Demmon, secretary and treasurer. Organized 1878, with capitalization \$2,500,000; issued, \$1,875,000. Lands adjoin the old Minnesota mine, now owned by the Michigan Copper Mining Co. Has produced nearly 6,000 tons of copper, and has paid dividends of \$320,000. Idle since 1893. Fully described in Vol. II.

NATIONAL MINING EXPLORATION CO.

ARIZONA.

Office: 1012-60 State St., Boston, Mass. W. H. Mitchell, president; Frank A. Woodward, secretary and treasurer; preceding officers, Wilbert Morgrage, A. P. Cheney, Chas. M. Bruce, H. H. Hazeltine and Kendric P. Crawford, directors; M. J. Galpin, superintendent; J. D. Coplen, consulting engineer. Organized November, 1905, under laws of Maine, with capitalization \$1,500,000, shares \$1 par. Lands, 7 claims, area circa 125 acres, lying $1\frac{1}{2}$ miles from Globe, Gila county, Arizona, with a good wagon road between, also claims on the Gila river, lying 7 miles west of Kelvin. Latter property shows 3 veins, in a mineralized zone of circa 500' width, opened by an old shaft of 130', which the present company plans deepening to 700'. Lands were held formerly by the Iron Cap Mining Co. Company plans vigorous development.

NATIONAL MINING & MILLING CO.

COLORADO & WYOMING.

Office: 1101 Fisher Bldg., Chicago, Ills. Mine office: Pearl, Larimer Co., Colo. O. S. Richardson, president; Ford H. Rogers, vice-president; J. J. Tufts, treasurer; C. E. Knapp, secretary and general manager; Harold Wilson, superintendent. Company controls the Chatterton Mining Co., Rogers Mining Co., Knapp Mining Co. and Pearl Smelting Co.

The Chatterton Mining Co. owns the Kurtz-Chatterton mine, 7 claims, area 125 acres, in the Upper Platte district of Carbon county, Wyoming, opened by shafts of 30', 35' and 38' and a 1,750' crosscut tunnel, showing 7 veins of low-grade sulphide ore traversing granite, the widest vein, 17', giving average assays of about 5% copper, with a trace of gold, ore being well adapted to concentration. Equipment includes a 5-stamp mill and 50-ton concentrator. Idle at last accounts.

The lands of the Rogers Mining Co. are 6 claims, area 110 acres, adjoining the Kurtz-Chatterton, opened by a 135' shaft and a crosscut tunnel of 1,100', showing low-grade ores, chiefly malachite, azurite and chalcopryite.

The Knapp Mining Co. owns 9 claims, area 80 acres, near Pearl, Larimer county, Colorado. Two fissure veins in gneiss and diorite, opened by shafts of 65' and 85', show chalcopryite and occasional bornite. The mine has a 25-h. p. steam hoist.

The Pearl Smelting Co. has a 175-ton blast furnace, with 175-h. p.,

steam plant, planned to do custom smelting as well as treating the ores of its allied properties. The smelter was uncompleted at last accounts.

NATIONAL RADIUM & COPPER CO.

COLORADO.

Office and works: 828 Equitable Bldg., Denver, Colo. Is a reorganization, circa 1905, of the Union Ore Extraction & Reduction Co. Works of the old company, at Thirty-first and Wewatta streets, Denver, used the Gardiner leaching and precipitating process, the mill having an estimated daily capacity of 300 tons, with estimated leaching and precipitating capacity of 75 tons daily.

NATIONAL SMELTING CO.

MEXICO.

Office: 2030 Land Title Bldg., Philadelphia, Pa. Mine office: Chalchihuites, Zacatecas, Mexico. Employs 300 men. L. H. Taylor, Jr., president; Richard G. Park, vice-president; William McKnight, secretary; John J. Little, treasurer; Theo. Montgomery, general manager; preceding officers, John P. Whitney, John P. Logan, Clarkson Clothier and Adolph Trauwitz, directors; John M. Bell, mine superintendent; Albert R. Wores, smelter superintendent; Henry Carnaghan, mill superintendent; Colin Timmons, engineer. Organized March 27, 1906, under laws of Maine, with capitalization \$1,000,000, shares \$5 par; issued, \$600,000. Bonds, \$150,000, at 6%. Annual meeting, second Tuesday in August. Operates in Mexico under title Cia. Beneficiadora de Minerales de Chalchihuites, S. A. Lands, 192 pertenencias, area 480 acres, in 10 groups, also a 38-acre mill-site, sundry water-rights and an option on 15,000 acres of timber lands, in the Chalchihuites and Sombrerete districts. Formation is mainly limestone, with frequent intrusions of eruptive rocks, ore bodies occurring as fissures in the eruptives, as pockets in the limestone, and as contact veins between limestone and eruptive rocks. Of the 10 properties, 6 are in operation, and 4 are shipping ore, the producing mines being the Anaconda, San Juan, Nungano and La Colorada, with La Esplendida and El Manto mines under development. The Anaconda shows a 36' vein, mined open-cast, giving ores averaging 2.5% to 3% copper. The Nungano has an ore body of 6' to 15' width, 120' length and 160' depth, giving ore of 2.5% to 3% copper tenor. The other mines carry auriferous silver-lead ores exclusively, these ranging from 20% to 45% lead, 1c oz. to 50 oz. silver, and \$2 to \$5 gold per ton. The Nungano has shafts of 30', 60' and 160' and tunnels of 250' and 300', and is estimated to show 100,000 tons of ore. Mines were opened in the Seventeenth Century, and until present ownership, had been worked, since circa 1850, in a small way, by local owners, with adobe smelters. The mines are operated exclusively by hand power, malacates being used.

Equipment includes a 50x60' machine shop, 20x25' smithy and 20x20' carpenter shop, all of timber and adobe, with about 20 other buildings, for various uses.

The concentrator, of 60 tons daily capacity, built of timber and iron, has a 14x17" Dodge crusher, 2 pairs of rolls, 3 New Century jigs, 2 sizers, 6 Bartlett and Standard tables, settling tanks, etc. The smelter, which also does

custom smelting, is at Chalchihuites, 1 to 12 miles from the various mines, having 7 brick stall calciners, a 10-ton reverberatory furnace and 50-ton water-jacket blast-furnace, latter working interchangeably on lead and copper ores, the copper product being a matte carrying circa 45% copper, 180 oz. silver and 2. oz. gold per ton, sent to the American Smelting & Refining Co., at Aguascalientes, for refining. Nearest railroad is the Mexican Central, 90 miles distant, but it is expected that a branch will be built from Gutierrez to Chalchihuites, circa 1908. Company plans opening mines on a larger scale and erecting a new concentrator at La Colorada mine. The smelter is to have a new 100-ton blast-furnace, roasting-furnace, refining-furnace, sampling mill and gas plant.

NATIONAL SMELTING CO.**SOUTH DAKOTA.**

Office, mine and works: Rapid City, Pennington Co., S. D. Mines ores carrying gold, silver and copper, latter being a by-product. Has a smelter, employing circa 200 men, at last accounts.

NATIONAL SMELTING & REFINING CO.**NEW MEXICO.**

Letter returned unclaimed from former works office, Lordsburg, Grant Co., N. M. Had a 50-ton smelter, built 1903, on the Aberdeen property, and held a contract to smelt ores of that moribund corporation of evil memory. Presumably dead.

NATIVE COPPER CO.**MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. M. Augustus O'Neil, president; F. W. Morandi, secretary and treasurer. Lands, 480 acres, in Keeweenaw county, Michigan, being the South $\frac{1}{2}$ of Section 3 and Northeast $\frac{1}{4}$ of Section 10, Town 58 North, Range 30 West. A little work was done, 1852-1855, on a fissure vein, since which time the property has been idle.

NAVERFJORD MINES.**NORWAY.**

Mine office: Naverfjord, Norway. Production, 1902, was 160 tons first-grade and 1,500 tons second-grade ore, containing metallic values equal to circa 180 metric tons fine copper.

NELSON COPPER FIELDS, LTD.**BRITISH COLUMBIA.**

Offices: 57 Moorgate St., London, E. C., Eng. Letter returned unclaimed from former mine office, Nelson, B. C. H. Shepherd Cross, chairman; C. S. Good, secretary. Capitalization, £100,000. Lands, 344 acres, on Morning Mountain. Idle since 1900.

NELSON COPPER SYNDICATE, LTD.**BRITISH COLUMBIA.**

Organized January, 1905, under laws of British Columbia, with capitalization \$10,000, shares \$100 par. Apparently inoperative.

GEWERKSCHAFT NEUE KIRCHE.**GERMANY.**

Mine office: Gross-Schliessensteinthal bei Goslar, Harz, Germany.

C. NEUMANN & CO.**CAPE COLONY.**

Said to own promising copper claims in Little Namaqualand, Cape Colony, South Africa.

NEVADA BELL COPPER MINING & REDUCTION CO.**NEVADA.**

Office: 850 Drexel Bldg., Philadelphia, Pa. Letter returned unclaimed from former mine office, Lovelocks, Humboldt Co., Nev. C. W. Sweitzer,

president; H. H. Barbee, vice-president; A. P. Platt, secretary and treasurer. Organized 1902, under laws of Nevada, with capitalization \$5,000,000, absorbing the Nevada Copper Co. and the Bell Mare Mining & Smelting Co. Lands, circa 500 acres, with considerable development. The 500' Bell Mare tunnel was planned to be driven 1,500', to cut the vein found in the Copper King tunnel. Ore bodies are said to be large, but of low grade, averaging about 4% copper, and occurring as replacements in a formation of andesite porphyry. Has a 60-ton smelter. Presumably idle.

NEVADA CENTRAL COPPER CO.

NEVADA.

Office: care of Robert L. Benson, secretary, 157 Michigan Ave., Chicago, Ills. Mine office: Palisade, Eureka Co., Nev. Col. Chas. Lay, president; Geo. W. Leighton, vice-president; preceding officers, William Andrews, Jos. D. Wright, John A. Saull and Edwin L. Wilson, directors. Organized under laws of District of Columbia, with capitalization \$1,000,000, shares \$10 par, in \$750,000 preferred non-cumulative 7% stock, and \$250,000 common stock. Lands, 10 claims, area 200 acres, in the Antelope district, on the western slope of the Sulphur Mountains. Development is by a 130' shaft, showing ores carrying claimed average values of 21.03% copper.

NEVADA CONSOLIDATED COPPER CO.

NEVADA.

Office: 66 Broadway, New York. Mine office: Ely, White Pine Co., Nev. James Phillips, Jr., president; Homer Loring, vice-president; Geo. E. Boas, secretary and treasurer; preceding officers, M. L. Requa, S. D. Loring, W. Hinckley Smith, Chas. Hayden, C. S. Shepard and E. H. Reynolds, directors; J. Parke Channing and F. W. Bradley, consulting engineers; E. F. Gray, superintendent; Thos. W. Cox, metallurgical engineer. Capitalization \$6,500,000, shares \$5 par. Is controlled by the Guggenheims, through control of the American Smelting & Refining Co., through control by latter of American Smelters Securities Co., through control by latter of 51% of Cumberland-Ely Mining Co., through ownership by latter by control of stock of the Nevada Consolidated Copper Co.

Lands, circa 1,400 acres, partly patented, in the Robinson district, 6 miles west of Ely, and circa 140 miles south of Toano station, on the Southern Pacific Railway. Lands include the properties formerly held by the White Pine Copper Co., Chainman Mining & Electric Co., New York-Nevada Copper Co., and by sundry other corporations and individuals. Principal properties are the Ruth group, area circa 300 acres, and the Eureka or Copper Flat group, one mile west of the Ruth, area circa 400 acres. Company also owns the Georgetown ranch, area circa 320 acres, including valuable water-rights on Murray creek, which carries a flow of about 4,000,000 gallons daily, assuring an ample water supply for mining, milling and smelting operations.

The geology of the district is much similar to that of the Clifton and Morenci deposits in Graham county, Arizona, and is to some extent similar to that of the Bingham Canyon district of Utah, in that ore values occur largely in the country rock. The tract shows an outcrop of gray, sintery quartz, showing occasional copper carbonates. One portion of the tract

shows an extreme width of about 2,000' of these croppings, under which, at a depth of circa 300', are found low-grade ores in the original plutonic quartz-porphyry. The upper workings show melaconite and chalcocite, changing at water level to disseminated chalcocite and chalcopyrite, the ore being mainly chalcocite, associated with pyrite, in fine seams, and occurring disseminated as speiss through the rock-mass. Walls of the ore bodies are not well defined, the entire formation being impregnated by ore to a greater or less extent. Estimates of the amount of ore in sight vary greatly, ranging from 6,000,000 tons to 25,000,000 tons, the larger figure probably being more nearly correct. The mine-water is strongly impregnated with copper, causing trouble with the pumps.

The Ruth mine has an ore body of 50' to 250' width, opened for a length of 900' and to a depth of 250'. The main shaft is 640' deep, showing large bodies of low and medium grade copper ore, with a marked tendency toward decreasing values at depth, leading to the opinion that the shaft may have passed through the bottom limit of payable ore. Estimates of the amount of ore in sight in the Ruth mine vary from 2,400,000 tons to 6,000,000 tons. Mr. Channing estimates the Ruth to show 2,400,000 tons of ore, averaging 2.6% copper, 0.05 oz. silver and 0.02 oz. gold per ton. A 4-compartment main working shaft is being sunk on the Star Pointer claim.

The Eureka mine shows ore of somewhat lower average value than the Ruth, and is opened by 2 shafts, known as the Eureka and Star of the West. The Eureka vertical shaft is 400' deep, bottomed in poor ore, with promising developments on the 170' level, where a careful sampling gave average assays of 2.32% copper, 0.03 oz silver and 0.02 oz. gold per ton, with 3,200,000 tons of ore in sight. The mine is opened for a distance of circa 700' east and west, and 800' north and south, showing payable ore over this area. The Eureka is to be worked on the caving system, or else by steam-shovel, and, in any case, the capping will be stripped by steam-shovel. Mr. Bradley estimates 16,000,000 tons of ore in sight at the Eureka.

Surface improvements at the Ruth mine include an engine-house, boarding-house, office, stable and 6 dwellings.

An experimental mill, built 1904, at the Ruth mine, has shown a concentration of 7 into 1, giving concentrates averaging 17.5% in copper tenor. The new reduction plant, now building on a 10-acre site, will be the first 1,250-ton unit of a 2,500-ton mill. Work on the second unit will begin as soon as the first is completed and in operation. The mill will have six 6' Huntington mills, in 2 groups, 2 heavy Blake crushers, 8 Overstrom tables and 91 vanners. Machinery equipment will include two 22x48" Allis-Chalmers compound condensing engines, direct-connected to 800-kw. Bullock generators, and the plant will have 7 motors of 20-h. p. to 100-h. p., for various uses, electricity being used throughout the mine and smelter. The mill buildings will be of steel throughout, and the plant has been designed with great care, embodying all of the latest metallurgical features of proven value.

The smelter will have 6 McDougall 3-deck circular roasters, 18' in diameter and 19' 6" high, each driven by a 20-h. p. Bullock induction motor.

Ores will be matted in reverberatories, instead of in blast-furnaces. Equipment will include a 16x32" blower, with capacity to reduce 6,000 cu. ft. of free air per minute to circa 18 pounds pressure per sq. inch. The smelter is planned to turn out blister copper of 99% in tenor, carrying \$10 in combined gold and silver values. Construction is proceeding somewhat slowly, owing to lack of rail facilities.

The Nevada Northern Railway Co., controlled by the Nevada Consolidated Copper Co., is building a line of approximately 140 miles length, from Ely to a junction with the Southern Pacific Railway at Cobre, 3 miles east of Toano. Capitalization of the railway company is \$2,000,000, with \$1,000,000 bonds, at 5%, and the line will cost \$1,250,000 to \$1,500,000, complete. The road is of standard gauge, and should be completed during the fall of 1906, after which work will be rushed on the reduction plant. The railroad will do a large general business, in addition to handling the traffic of the Nevada Consolidated Copper Co.

This property is one of altogether exceptional promise, and enjoys the benefit of a management that is both experienced and financially strong. Mr. J. Parke Channing, than whom there is no better copper authority, estimates that an investment of about \$3,000,000 will be required in constructing the railway, opening mines and building a reduction plant to give the property an annual productive capacity of circa 25,000,000 pounds fine copper, which should be made, according to the same authority, for 7 cents per pound. The Nevada Consolidated may not become an important producer until 1907, and another year will be required to put the property on the basis estimated by Mr. Channing.

**NEVADA CONSOLIDATED COPPER & GOLD
MINING & MILLING CO.**

NEVADA.

Office: 506-31 State St., Boston, Mass. Mine office: Yerington, Lyon Co., Nev. Jas. P. Niles, president and general manager; Jas. D. Niles, treasurer. Organized under laws of Maine, with capitalization \$1,000,000, shares \$1 par. Lands were 16 copper claims in Lyon county and 12 gold claims in Lincoln county, Nevada, but the copper claims were lost. Finances apparently hopelessly involved.

NEVADA CONSOLIDATED SMELTING & REFINING CO.

NEVADA.

Office: 201 Exchange Bldg., Denver Colo. Works office: Pioche, Lincoln Co., Nev. Wm. Gelder, manager. Has a 200-ton smelter and 22 miles of narrow-gauge railroad. Is closely affiliated with the Hillside Copper Co. and Bristol Copper Co. Is in debt and idle.

NEVADA COPPER CO.

NEVADA.

Merged, 1902, in Nevada Bell Copper Mining & Reduction Co. Property was near Lovelock, Humboldt county, Nevada.

NEVADA COPPER CO.

NEVADA.

Mine office: Sandy, Lincoln Co., Nev. N. M. McFatrige, president. Lands, 13 claims, showing an auriferous copper vein, assaying up to 32% copper and \$20 gold per ton, paralleled by a silver-lead vein, showing gross assay values up to \$150 per ton, opened by a 90' shaft. A small smelter shipment,

to El Paso, gave returns of 50% copper, with gold and silver values. Company is said to have a contract with the Goodsprings Smelting Co. to treat its ores. Property is considered promising.

NEVADA DEVELOPMENT CO.**NEVADA.**

Office: 201 Walnut Place, Philadelphia, Pa. Mine office: Lovelock, Humboldt Co., Nev. Theo. H. Lowe, superintendent. Lands include the Copper Glance and adjoining claims. Idle at last accounts.

NEVADA GOLD & COPPER MINING CO.**NEVADA.**

Letter returned unclaimed from former office, San Francisco, Cal.

NEVADA QUEEN MINING CO.**NEVADA.**

Office: care of J. K. Miller, P. O. Box 1202, Colorado Springs, Colo. No particulars secured in response to requests, although company advertises a strong desire to furnish details to all inquirers.

NEVADA-UTAH MINES & SMELTERS**NEVADA & UTAH.****CORPORATION.**

Office: 100 Broadway, New York. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Pioche, Lincoln Co., Nev. Col. John Weir, president; Edward F. Cragin, vice-president; Anthony H. Godbe, managing director; Morris P. Kirk, general manager; Edward F. Freudenthal, superintendent; preceding officers, Hon. A. B. Lewis, Chas. J. Hodge, A. S. McCormick, J. P. Haines and John W. Griggs, directors; C. J. Caughey, secretary; Heman Dowd, treasurer; John R. Dos Passos, general counsel; G. F. Milliken, managing engineer. Organized, 1904, under laws of Maine, with capitalization \$15,000,000, shares \$10 par. Debentures, authorized, \$1,000,000, registered 5-year 6% gold bonds, due Dec. 1, 1909, convertible at option of holders, after Dec. 1, 1906, into common stock, at par.

Landed holdings are extensive and valuable, but just how extensive cannot be stated positively, as the holdings seem to vary. Senator Lewis, the organizer of the Nevada-Utah Mines & Smelters Corporation, has been, for about ten years past, engaged in promoting, organizing and reorganizing mining companies in Utah and Nevada. A survey of Senator Lewis's promotions, from year to year, gives a kaleidoscopic impression of organizations, reorganizations, reconstructions and re-reorganizations, with wheels within wheels, and corporations within corporations, all coming in, going out, re-entering or disappearing, in a sort of bedlam dance that seems to lack the semblance of system. Mr. Lewis seems to consider that the public has no particular right to information regarding his promotions, once the stock is placed, and presumably is so busy in organizing and reorganizing his numerous promotions, that he really has no time to answer annoying questions, or allow a glimpse of his private corporate necropolis.

The Nevada-Utah Mines & Smelters Corporation presumably is a securities-holding company, and controls, or did control, or is supposed to control, or to have controlled, or at least is supposed to control or to have controlled, or to have attempted to control or to have desired or intended to control, various subsidiary corporations, mostly of Senator Lewis's

previous manufacture, among this list being the Imperial Copper Co., Royal Gold & Copper Mining Co., Manhattan Copper & Gold Mining Co., Royal Gold & Copper Co. and New-England-Utah Mining Co. As most of these corporations are reorganizations, some raised to the nth power, and no information has been forthcoming from any of them, the task of verifying the alleged holdings of the Nevada-Utah Mines & Smelters is one that might well appall the stoutest-hearted seeker after truth. If an injunction could be secured, restraining Senator Lewis from perpetrating any further incorporations for a reasonable period, it might be possible to untangle the skein, but with new material coming in at the front end faster than the old can be untwisted, assorted and labeled at the rear, the prospects for a really luminous exposition of the truth seem rather poor.

The landed holdings of the Nevada-Utah Mines & Smelters Corporation were supposed, in 1905, to consist of the Imperial, Montreal and Comet mines, in Beaver county, Utah, the Last Chance mine, at Bingham Canyon, Salt Lake county, Utah, and the Manhattan and Pioche Consolidated mines, and the Bullionville tailings, at Pioche, Lincoln county, Nevada. The Beaver county mines seem to have been mislaid accidentally, presumably in a moment of abstraction, and as near as can be learned, the holdings in 1906 include the Last Chance mine at Bingham, the Pioche group in Nevada and possibly the Imperial group in Beaver county, Utah. Whether these are held by direct title, or through subsidiary companies, has not been ascertained but it is considered probable that the properties are held through sub-companies.

The Last Chance group, formerly owned by the New-England-Utah Mining Co., has 13 claims, area 115 acres, lying southwest of the Boston Consolidated, in the West Mountain or Bingham district of Salt Lake county, Utah, showing sundry contact and fissure veins of 3' to 50' width, carrying good values in copper, lead, silver and gold, developed by tunnels aggregating 7,000', and having about 2 miles of underground workings. Equipment includes a 100-ton concentrator, which was being remodeled, early in 1906. The Last Chance has been idle for several years, except for a little work by leasers, but is well located, and is considered a promising property.

The Imperial group, which includes the Comet mine, area 400 acres, lies near the Horn Silver, Cactus and Majestic mines. The Imperial group, developed by tunnels, has carbonate ores above and sulphides at little depth, assaying up to 30% copper, 15% lead, 18 oz. silver and \$1 to \$9 gold per ton. Ore is mainly of concentrating grade, but considerable high-grade ore has been shipped to smelters, from time to time. The Comet mine of the Imperial group, adjoining the Cactus, and having rail connections, undoubtedly carries a continuation of the Cactus vein of the Newhouse Mines & Smelters, and has considerable development, ore being mainly of concentrating grade, carrying fair values in copper, silver and gold.

Latest semi-authoritative data regarding the Nevada property of the Nevada-Utah Mines & Smelters Corporation give the Pioche holdings as 35 claims. The Manhattan group had 55 claims, and the Pioche group

had 63 claims, according to best available information in 1905. At any rate, the holdings, of the Nevada-Utah included, in June, 1906, two groups, formerly held by the Pioche Consolidated Mines Co. These mines were extensive producers of silver-lead ores, until closed down, 1893, and are popularly credited with a past production of \$20,000,000. The May Day mine of this property has a shaft 1,100' deep, and there are two old shafts on the Yuba mine, an adjoining property, and Meadow Valley No. 5 shaft, with 3 compartments, is 400' deep. A 700' Leschen aerial tram is being built from the May Day shaft to ore-bins on the mine's private railway, running from the mine to Pioche, which has been reconstructed and put in operation. Nearest outside railway is the San Pedro line, 28 miles distant. The Pioche has a good mining equipment and a 300-ton smelter, the latter somewhat antiquated in design and equipment.

The Bullionville tailings, which may or may not be included in the present holdings of the Nevada-Utah, contain circa 150,000 tons of sands and slimes, the residue from Pioche ores milled, assaying \$16.43 per ton in gold, silver and lead, and which a modern concentrating and slimes plant should be able to rework at a good net profit.

The Pioche and Bingham properties controlled by the Nevada-Utah Mines & Smelters Corporation are properties of decided promise, and, with good management, should become large and profitable producers of copper, lead, silver and gold.

NEVER SWEAT MINE

MONTANA.

Owned by Anaconda Copper Mining Co.

NEW AMERICAN MINING & MILLING CO.

UTAH.

Letter returned unclaimed from former mine office, Brigham, Utah.

NEW ARIO COPPER & EXPLORATION CO., LTD.

MEXICO.

Offices: 35, Lamb's Conduit, London, W. C., Eng. Mine office: Ario, Michoacán, Mex. R. Gautier, managing director; G. Harmant, secretary. Organized March 27, 1897, with capitalization £100,000, shares 4s. par; issued, £90,422. Property is sundry copper claims, near Ario. Idle.

NEW BALLA BALLA COPPER MINES, LTD.

AUSTRALIA.

Offices: 6, Great St. Helen's London, E. C., Eng. Mine office; Port Balla Balla, Western Australia. T. W. Williams, chairman; E. A. Foster, secretary; W. H. Mitchell, legal manager in Western Australia. Organized Apr. 16, 1901, as a reconstruction of the Balla Balla Copper Mines, Ltd., with capitalization £250,000, shares £1 par; issued, £138,599. Lands, 63 acres, in two groups, in the Pilbarra district, 11 miles from Port Balla Balla. Has a 30-ton smelter, and a smelting test, 1905, is said to have given satisfactory results.

NEW BOSTON MINING CO.

MONTANA.

Office: Eden Valley, Minn. Mine office: Corbin, Jefferson Co., Montana. Ores carry gold and copper. Company advertises that it will make its shareholders wealthy, and that its stock is "fully guaranteed by 10-year gold bonds bearing 3% interest—50 per cent commission to agents—why not become a mining king?" Cannot be learned that any work is in progress, and company is a mere stock-jobbing scheme, of course.

NEWBURY MINING CO.**ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. C. M. Schofield, manager. Is supposed to have resumed work, early in 1906.

NEW CALEDONIA COPPER CO., LTD.**NEW CALEDONIA.**

Reorganized, 1899, as Caledonia Copper Co., Ltd.

NEW CENTURY EXPLORATION IDAHO, OREGON & WASHINGTON. & INVESTMENT CO.

Office: care of J. W. McCoy, president; 500-125 La Salle St., Chicago, Ills. Mine office: Darrington, Snohomish Co., Wash. J. C. Morehouse, vice-president; Joseph G. English, treasurer; H. A. Burdick, secretary; T. T. Watson, assistant secretary; N. L. Franke, mine manager. Organized under laws of Arizona, with capitalization \$7,500,000, shares \$10 par. The Forrest-Chickamun mine, on Gold Mountain, near Darrington, area circa 400 acres, is claimed by company to have 700,000 tons of auriferous and argentiferous copper ore, worth \$10 per ton, blocked out, and management claims that a 250-ton concentrating and smelting plant is to be erected, during 1906. Company also has gold claims in Elmore county, Idaho, and Baker county, Oregon. Claims of company seem excessive.

NEW CHILLAGOE RAILWAY & MINES, LTD.**AUSTRALIA.**

Title changed back, 1905, to Chillagoe Railway & Mines, Ltd.

NEW CLARA ST. DORA MINING CO. (NO LIABILITY.)**AUSTRALIA.**

Office: Port Adelaide, South Australia. Mine office: Alberin Creek, via Hergott, South Australia. Employs 12 men. F. S. Chany, chairman and secretary; H. Paull, manager. Organized March, 1898, under laws of South Australia, with capitalization £10,000, shares £1 par; issued, £5,345. Lands, 4 claims, area 160 acres, held under 40-year lease, in the Hergott district, showing limestone country rock, carrying an ore body, opened by shallow shafts and open-cuts, showing malachite and chalcocite, occurring as nodules in hard limestone, and as veins in soft limestone. Has a 38-h. p. steam plant, with hoist good for 400' depth. Ores, as treated, average 26% copper, without gold or silver values. Has a small mill, with one crusher, 1 set of rolls and 1 Mays jig. Mine is served by the South Australian railway, 5½ miles distant. Production, 1905, was 15 long tons fine copper, and is estimated by the company at 25 tons for 1906.

NEW CLONCURRY COPPER & SMELTING CO., LTD.**AUSTRALIA.**

Offices: 116, St Vincent St., Glasgow, Scotland. R. L. Alston, chairman; B. F. G. Meldrum, secretary. Organized Oct. 29, 1895, with capitalization £3,300, shares 6s each. Lands, sundry small mines in North Queensland, idle for some years, pending construction of a hoped-for railroad.

NEW COLUMBIA MINING CO.**IDAHO.**

Mine office: Salmon, Lehmi Co., Idaho. Ores carry copper and gold. Has steam power and a 10-stamp mill. Presumably idle.

NEW DOMINION MINES CO.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Organized 1905, with capitalization \$1,000 000.

NEW ENGLAND-ARIZONA COPPER CO.

ARIZONA.

Said to have been organized, 1906, to take over the Thiesing group of 17 claims, in the Crazy Basin, Yavapai county, Arizona. Possibly a re-organization of the New England & Arizona Copper & Gold Mining Co.

NEW ENGLAND-ARIZONA COPPER-GOLD MINING CO.

ARIZONA.

Office: care of J. W. Stonehouse, Douglas, Ariz. Organized 1905, with capitalization \$3,000,000, to take over sundry copper claims near Paradise, Cochise county, Arizona, and on Sadle Mountain, near Dudleyville, Pinal county, Arizona.

NEW ENGLAND & ARIZONA COPPER

ARIZONA.

& GOLD MINING CO.

Office: care of Louis Harlow, secretary and treasurer, 69 Pearl St., Boston, Mass. Letter returned unclaimed from former mine office, McCabe, Yavapai Co., Ariz. Edmund D. Fisk, president; Leonard T. Farris, vice-president. Organized January, 1901, under laws of Arizona, with capitalization \$750,000, shares \$1 par. Lands, 5 claims, known as the Red Star group, near the Silver Belt mine, in the Big Bug district. Has a steam hoist and about 300' of underground openings. Possibly reorganized, 1906, as the New England-Arizona Copper Co.

NEW ENGLAND & CLIFTON COPPER CO.

ARIZONA.

Office: 43 State St., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. E. Rollins Morse, president; Arthur P. Ayling, general manager; C. C. Burger, consulting engineer. Capitalization \$5,000,000, in \$2,000,000 preferred 8% stock, cumulative after payment of first 8% dividend, and \$3,000,000 common stock; issued, \$1,000,000 preferred and \$2,500,000 common stock. Present company succeeded the New England Copper Co. and the Clifton Consolidated Copper Mines of Arizona.

Lands, 78 claims, area 1,006 acres, circa 5 miles northwest of Clifton, on the north side of the San Francisco river. The Clifton had 7 shafts, of 70' to 315' depth, also tunnels of 220', 450', 700', 800', 1,000' and 1,700', and is opened to a depth of 800'. Ores are principally chalcopryite and chalcocite, with occasional oxides and carbonates, all slightly auriferous and argentiferous. The main vein is said to show an extreme width of 150'. The New England is opened by shafts of 400' and 500' and a 2,000' tunnel, showing fissure veins instead of the blanket vein noted at Clifton, 3 miles distant. Principal vein is 5' to 6' wide, carrying cuprite, chalcocite and chalcopryite, all of very high grade. The various mines of the company show a large amount of ore, of all grades from very poor to very rich.

The mines have steam, gasoline and electric power. A 3-mile ground-tram, of 20" gauge, is being built from the mines to the railroad, and when this is completed, the company plans shipping ores to the Shannon reduction works. Early in 1906 the mines were producing circa 25 tons daily, shipped under disadvantageous circumstances. Management is considered good, and property regarded as promising, though not yet developed to the point of large and profitable production.

NEW ENGLAND-COLORADO COPPER MINES CO.**COLORADO.**

Letter returned unclaimed from former office, Denver, Colo. Capitalization \$200,000, shares \$1 par. Had lands in Fremont and Chaffee counties, Colorado.

NEW ENGLAND COPPER CO.**ARIZONA.**

Succeeded, circa 1904, by New England & Clifton Copper Co.

NEW ENGLAND GOLD & COPPER MINING CO.**UTAH.**

Office: 64-18 Tremont St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 28 men. D. W. Williams, president; E. E. Abercrombie, vice-president and managing director; Geo. F. Bradstreet, secretary and treasurer; preceding officers, James S. Williams, Thomas Kellough, Arthur P. Hosford and Dr. James R. Piper, directors; H. M. Adkinson, manager; D. J. Cook, mine and mill superintendent. Organized June, 1899, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par; issued, \$817,000. Bonds, \$500,000 authorized, at 6%; issued, \$108,000. Annual meeting, first Monday in June.

Lands, 9 fractional claims, patented, area 18 acres, in the West Mountain or Bingham district, showing porphyry country rock carrying 3 principal fissure veins, of 30" average width, 1,000' average length and known depth of 400', opened by a 159' shaft and 2 tunnels, known as the Nast, of 1,600' and the Benton, of 1,670' length, both driven on the vein, with a total of 5,600' of workings. Ores give average assays of 30% lead, 10% zinc, 15 oz. silver and \$4.50 gold per ton, with small and variable values in copper, in addition to which the monzonite country rock carries small copper values, and may be proven workable, later.

Property has a 30-h. p. hoist, good for 800' depth, and a concentrator equipped with a 4x12" Sturtevant crusher, 2 sets of rolls, 2 double Hartz jigs and 1 Wilfley table. Mine is served by the Denver & Rio Grande railroad, 2 miles distant. Production, 1905, was circa 600,000 pounds lead, 20,000 oz. silver and 110 oz. gold. Management plans extending mine openings, adding a complete electrical equipment to the power plant and enlarging the mill, during 1906. Property is considered well located, and promising.

NEW ENGLAND MINING CO.**MASSACHUSETTS.**

Office: 35 School St., Greenfield, Mass. Mine office: Charlemont, Franklin Co., Mass. Othello A. Fay, president; Capt. Geo. H. Davenport, treasurer and general manager. Organized 1902, with capitalization \$500,000, shares \$5 par. Lands, circa 1,000 acres, 2 miles west of the Davis pyrite mine, latter worked since circa 1880. Vein, traced circa 700', is approximately vertical, conforming closely in dip and strike with the Savoy schist in which it occurs, and apparently is a fahlband, lacking well defined walls, ore occurring scattered through 15' to 20' of the schist, with a 6" to 12" vein of quartz, well mineralized, on the south wall, and a heavy impregnation of chalcopyrite, 1' to 2' wide, on the north wall. Has been partly stripped, and vein trenched across. Presumably idle.

NEW ENGLAND-UTAH MINING CO.**UTAH.**

Controlled by Nevada-Utah Mines & Smelters Corporation.

NEW ERA MINING CO.**MEXICO.**

Had copper claims, south of La Cananea, Sonora, Mexico, circa 1902.

NEWFOUNDLAND COPPER CO., LTD.**NEWFOUNDLAND.**

Absorbed, 1901, by Carmen Copper Mines, Ltd.

B. NEWGASS & CO.**SPAIN.**

Offices: 7, Lothbury, E. C., Eng. Lands, at Arrieta and Changoa, Navarra, Spain, include the Ollin, Arrieta and Changoa mines, carrying silver, lead and copper ores. Idle for some years.

NEWGATE MINE.**CONNECTICUT.**

An old and idle property, at Granby, Hartford county, Connecticut.

NEW HIGHLAND GOLD & COPPER MINING CO.**CALIFORNIA.**

Office: 1209 Broadway, Oakland, Cal. Mine office: Georgetown, El Dorado Co., Cal. Thos. F. Graber, vice-president; C. L. Colvin, secretary and treasurer; Ira C. Jenks, financial secretary; J. A. Parker, superintendent. Organized Sept. 11, 1903, under laws of California, with capitalization \$2,000,000, shares \$1 par. Lands, 11 copper claims and 9 gold claims, area 555 acres, on the mother lode, in the Georgetown district, showing a fissure vein in slate, giving assays of 15% copper, 15 oz. silver and \$2.50 gold per ton. Copper property is idle.

NEWHOUSE MINES & SMELTERS.**UTAH.**

Office: 71 Broadway, New York. Operating office: Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Employs 285 men. Samuel Newhouse, president; L. N. Kramer, vice-president; John Josten, secretary and treasurer; Lafayette Hanchett, general manager; Alexander D. Moffatt, superintendent; A. J. Bettles, chief metallurgist; D. H. Waterbury, lixiviation superintendent; Victor Carlson, mine superintendent; Louis L. Bailey, mill superintendent; A. C. Dart, engineer.

Lands, in Copper Gulch, 7 miles from Frisco, are very extensive, including the Cactus group, which has had several previous ownerships, but never was a success, until taken over by the present company. Country rock is monzonite porphyry, and the Cactus mine is essentially a pyritic impregnation of a shear zone, in a body of monzonite, near a limestone contact. Ore is coarsely crystalline pyrite, carrying a little chalcopyrite, with very small gold and silver values, averaging perhaps 30 cents per ton, and practically without lead or zinc, averaging 2.5% copper. Company reports the main ore body as 175' wide, 700' long and 600' deep, with a north-westerly strike and vertical dip. The mine has 2 shafts, of 600' depth each, the main working shaft having 3 compartments, with levels opened, at intervals of 100'. The principal mine opening is a tunnel, of 6,200' length, connected with the 600' level of the shafts. The tunnel has a grade of 5%, and is laid with 30-lb. steel rails. Trimming is done by 2 electric locomotives, each hauling trains of 21 cars. The tunnel is electric lighted throughout, and cuts several cupriferous veins before reaching the main vein. The mine has about 2.5 miles of underground workings, estimated to show 4,000,000 tons of ore. A crosscut to the old French shaft shows a 50' ore body, and 2 tunnels driven west therefrom show a 100' ore body.

It is planned to extract a large portion of the ore mined by steam-shovels, beginning 1906. The ore will be blasted, with black powder, two men being capable of doing sufficient drilling and blasting, by cutting the ore down in slices, to supply one steam-shovel, handling 400 tons per 10-hour shift, with a crew of 6 men. The Newhouse tract carries upwards of one mile of the strike of the great Cactus vein, and also carries various smaller veins of higher grade ore, running up to 10% in copper tenor.

After reaching the portal of the main tunnel, the electric trains pass over a high trestle to an ore-building, where 7 cars at a time are run into a great steel tube, which is partially rotated, and the ore in the cars dumped onto grizzlies, oversize going to Blake crushers, that reduce it to lumps of 1" size and smaller, fines and crushed ore going to 300-ton storage bins, whence the ore is loaded into railroad cars and taken to the mill. The mine has a 200-h. p. plant, including a 150-h. p. hoist, good for 600', and works 35 power drills.

The mill, 2 miles from the mine, built of steel, is 100x400' in size, in 2 duplicate sections, of 1,000 tons aggregate daily capacity. The western section, which is the concentrator proper, is of structural steel, with corrugated iron siding and roof, while the power plant, under the same roof, is of structural steel and brick. The concentrator is designed on the unit plan, allowing for future expansion. Equipment includes three 10x24" Blake crushers, 4 sets of rolls, 18 Hartz jigs, 32 Wilfley tables and 8 Wilfley slimers, also a Hancock jig, which is doing the work of 8 Wilfleys, Sherman settling tanks and classifiers, and a 15-ton Whiting traveling crane. Ore is received and dumped into 1,000-ton steel bins, whence it is drawn out by belt-conveyors equipped with plunger feed, and transferred to elevators, of which they are two for each section, one for dry and one for wet ore. The mill is putting about eight tons into one, and is saving about 80% of the assay values. Early in 1906, Mr. D. H. Waterbury was installing a 40-ton experimental lixiviation plant, for leaching oxidized ores of the Cactus, averaging 2.5% copper and carrying small gold and silver values. The leaching plant embodies certain features patented by Mr. Waterbury.

The power plant includes five 350-h. p. Babcock & Wilcox water-tube boilers, and a Green fuel economizer, with a 165' self-supporting steel smoke-stack, of 8' diameter. There is a 2,500' forty-drill Ingersoll-Sergeant air-compressor and two 500-h. p. Westinghouse-Parsons steam turbines, making 3,600 revolutions per minute, direct-connected to two 400-kw. Westinghouse generators that furnish all power, except compressed air, that is used in the mine and mill. Other buildings include a 30x50' brick machine-shop, 40x50' wood carpenter shop and a smithy.

The mine and mill are connected by the Newhouse, Copper Gulch & Sevier Lake Railroad, 2.3 miles in length, of standard gauge, owned by the company, and connecting with the San Pedro & Salt Lake railroad. The railroad has one Shay locomotive and 5 dump-cars. Power is furnished the mine by compressed air, piped through a line of 13,000' length, which operates steam-shovels and hoists, water for steam purposes not being available

at the mine. Water is brought from 6 large springs, at Wah Wah, 8.5 miles from the mill, through a line of 12" and 14" riveted steel pipe, laid across Preuss valley and discharges into a cement reservoir of 300,000 gallons capacity, located on high ground above the mill and townsite, the springs having a flow of circa 1,050 gallons per minute. A townsite, called Newhouse, has been platted, near the mill, and the company owns therein 47 dwellings, a club-house, bunk-house, boarding-house and a brick hotel accommodating 150 men. Miscellaneous improvements include a sawmill and a 3-ton ice plant, the latter highly necessary in summer, as the property is on the edge of the Escalante desert. Fuel is soft coal, costing \$4.50 per ton.

Production was begun, March 15, 1905, and 125,000 tons of ore were treated during the year, making concentrates of circa 12% copper tenor, with a production of 5,670,993 lbs. fine copper, 53,862 oz. fine silver and 2,272 oz. fine gold. Production for 1906 is estimated by company as likely to be about 7,000,000 lbs. fine copper. Mining cost was \$1.75 per ton and milling cost 70 cents per ton, during 1905, but these costs probably can be reduced greatly and the cost of mining with steam-shovels should reach 50 cents per ton eventually. The development of this property has been slower than was expected, but the work has been done along thoroughly sound lines, and it is probable that ore production will be increased to 2,000 tons daily, within two or three years, and eventually to 3,000 tons per diem, or more, as the ore bodies are of immense size, though low in grade, and the future profits of the company depend largely upon securing a maximum tonnage.

NEW JERSEY METAL REFINING WORKS, LTD.

NEW JERSEY.

Works office: Elizabeth, N. J. Owned by Mountain Copper Co., Ltd.

NEW LINCOLN COPPER CO.

WYOMING.

Office: Chicago, Ills. Mine office: Holmes, Albany Co., Wyo. W. J. Sherwood, president; Dorchester Mapes, vice-president; W. S. Smyth, Jr., secretary; C. A. Louckes, treasurer. Organized under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued \$650,000. Lands, 2 claims, patented, area 40 acres, lying north of and adjoining the Rambler mine, on which shafts of 30' and 50', sunk to cut the extension of the Rambler vein, are said to show auriferous and argentiferous copper ore.

NEW LONDON MINE.

MARYLAND.

Office: care of Capt. Edward S. Wertz, owner, Washington, D. C. Property, in Frederick county, Maryland, includes 64 acres of mineral land and 14 acres of timber land. Mine was worked, 1835-1855, and is said to have yielded a profit. Idle since 1888, until 1903-04, when unwatered and shaft retimbered, but no ore extracted. Ores are bornite and chalcocite, in a vein of 3' to 4' in dolomite, with bands of phyllite, ores assaying 3.5% to 70% copper. Has 4 tunnels, longest 104', and a 210' shaft, with about 500' of underground openings. Idle.

NEW MAMMOTH MINING & MILLING CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. Ores carry gold, silver and copper. Has steam power. Idle.

NEW MEXICO COPPER MINING & SMELTING CO. NEW MEXICO.

Letters returned unclaimed from former office, Hartford, Conn., and former mine office, Lucera, Mora Co., N. M.

NEW MEXICO DEVELOPMENT CO. NEW MEXICO.

Mine office: Fierro, Grant Co., N. M. Idle.

NEW MEXICO GOLD & COPPER MINING CO. NEW MEXICO.

Office: 39 Cawker Bldg., Milwaukee, Wis. Mine office: Tres Piedras, Rio Arriba Co., N. M. Wm. H. Devos, president; M. D. Kelly, secretary and treasurer; Richard Cole, superintendent. Organized 1897, under laws of New Mexico, with capitalization \$2,500,000, shares \$1 par. Lands, 11 claims, area 140 acres, in the Bromide district, showing fissure veins in schist, and contact veins between schist and granite. Five veins are being developed, these averaging 7' in width and giving assays of 5% to 40% copper, from native copper, carbonate and sulphide ores, with occasional high values in gold. Has a 130' shaft and 265' of underground openings, with steam power and a Norwalk air-compressor. Company platted a townsite, called Bromide City, and endeavored to replenish its depleted exchequer by sale of town lots, in addition to which a \$25,000 issue of 7% gold bonds is being offered shareholders. Apparently company is hopelessly involved.

NEW MICHIGAN COPPER MINING CO. WYOMING.

Office: Laramie, Wyo. Idle.

NEW MOUNT HOPE COPPER MINING CO., LTD. AUSTRALIA.

Mine office: Mt. Hope, N. S. W., Australia. R. M. Kirk, general manager. Mine, opened 1878, is about 90 miles south of the Great Cobar. Ores are mainly chalcopryrite and bornite, with sandstone gangue, in a country rock of ferruginous slates and sandstones, with oxidized ores mainly earthy carbonates above the 250' level, deepest shaft being 400'. Ore bodies, having an extreme width of 80', occur as replacements in the country rock, without defined walls. General formation and physical features resemble the Great Cobar mine. Ore is concentrated about 5 into 1, and is smelted in a plant having 5 small furnaces, using iron ore, secured 12 miles distant, for a flux. Made 5,070 long tons fine copper, 1878-1898, inclusive.

NEWPORT & ARIZONA COPPER & GOLD MINING CO. ARIZONA.

Letter returned unclaimed from former office, 60 State St., Boston.

NEW RED WING MINING CO. UTAH.

Succeeded, 1905, by Utah Development Co.

NEW RIO TINTO COPPER CO., LTD. SPAIN.

Absorbed, circa 1904, by Caridad Copper Co., Ltd.

NEW RIVER COPPER CO. ALABAMA.

Office: care of F. W. Pratt, Huntsville, Ala. Organized August, 1902, under laws of Delaware, with capitalization \$1,000,000. Presumably idle.

NEW ST. ELMO GOLD & COPPER CO.

Office: 45 Broadway, New York.

NEWS BOY COPPER MINING CO. WYOMING.

Letter returned unclaimed from former mine office, Encampment, Wyo.

Lands, sundry claims, on Beaver Creek, circa 12 miles south of Encampment, on which considerable development work has been done.

NEWS COPPER MINING CO.

ARIZONA.

Mine office: Jerome, Yavapai Co., Ariz. J. D. Dennis, superintendent. Lands, sundry claims, $1\frac{1}{2}$ miles southeast of Jerome. Shaft was unwatered and retimbered, 1905, after several years' idleness, and property was investigated by F. August Heinze, but was not taken by him, as it failed to prove as represented.

NEW SLEEPY HOLLOW GOLD MINING CO.

COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power.

NEW STATE COPPER MINING CO.

ARIZONA.

Office and mine: Tucson, Pima Co., Ariz. James W. Bogan, president; Chas. Bent, vice-president; Lyman W. Wakefield, treasurer; Ralph K. Shelton, secretary. Lands, 10 claims, circa 10 miles west of Tucson, showing country rock of limestone, with a prominent gossan, carrying oxidized ores and a little chalcocite with gold and silver values, suitable for fluxing ore, and presumably underlain by copper ores of fair tenor. Development is by a 40' shaft, showing a little chalcopyrite, and by a short tunnel.

NEWTON COPPER CO.

CALIFORNIA.

Office: 420 Montgomery St., San Francisco, Cal. Mine office: Ranlett, Amador Co., Cal. Horace D. Ranlett, president and general manager. Organized 1887, under laws of California, with capitalization \$200,000, shares \$5 par. Lands, 100 acres, patented, showing 3 fissure veins in slate, carrying an average of 8% copper, mainly in sulphide ores. Mine, opened 1861, has shafts of 200' and 430', with about 20,000 tons of ore in sight. Has steam power, and smelter with an 80-ton water-jacket blast-furnace, also a 100-ton leaching plant, ore being especially adapted to lixiviation. Idle since circa 1903.

NEW UTAH MINING CO.

UTAH.

Office: Salt Lake City, Utah. Hugh Heffernan, president; W. W. Thompson, vice-president; Geo. A. Udall, secretary; James Norman, treasurer; Timothy Manion, manager. Lands are in Tooele county, Utah, near the Flying Dutchman mine.

NEWTON MINE.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Lands, near Elwood, 7 miles from Encampment, are opened by a 125' shaft, said to show a 12' vein.

NEW VELVET-PORTLAND MINE, LTD.

BRITISH COLUMBIA.

Offices: 535, Salisbury House, London, E. C., Eng. Mine office: Rossland, Trail Division, Yale district, B. C. Allan Maclean, chairman; F. A. Labouchere, secretary; S. Severin Sørensen, general manager. Organized November 18, 1905, as successor of the Velvet-Portland Mine, Ltd., with capitalization £10,000, shares £1 par. Lands, sundry claims, on Sophie Mountain, Rossland, carrying auriferous copper ores, said to average circa \$14 per ton in value. Has a 75-ton concentrator with three Tremaine two-stamp mills, 2 Overstrom tables, two sets of Brown's hydrometric classifiers, and one Jenckes

crusher, putting five tons into one. Concentrates are sent to the Northport smelter, for treatment. Has a good steam plant.

NEW VIGSNAES COPPER CO., LTD.

NORWAY.

Offices: 29, St. Mary St., Cardiff, Wales. H. A. Evans, secretary. Organized October 28, 1905, with capitalization £10,000, shares £1 par, to acquire the Vigsnaes copper mine, on Karme Island, Norway.

NEW WORLD SMELTING CO.

MONTANA.

Office: 306 Pacific Blk., Seattle, Wash. Mine office: Gardiner, Park Co., Mont. Dr. G. L. Tanzer, president. Lands, sundry claims, 60 miles from Gardiner and $3\frac{1}{2}$ miles east of Yellowstone National Park. Company is said to have contracted with the Colorado Iron Works Co. for a 100-ton copper matting furnace, and to plan installing a lead stack also. Installation planned is said to include a hydro-electric plant, with McCormick turbine water-wheels, direct connected to Bulluck generators.

NEW YELTA COPPER MINING & SMELTING CO., LTD.

AUSTRALIA.

Mines, sold, 1903, to Paramatta Copper Mines, Ltd.

NEW YORK-ALASKA MINE.

ALASKA.

Office: care of Saml. I. Silverman, general manager, Ketchikan, Alaska. Property is near the Brown-Alaska, on Prince of Wales Island.

NEW YORK & ARIZONA COPPER MINING & SMELTING CO.

ARIZONA.

Office: 261 Broadway, New York. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Lionel Hageners, president; E. G. Macqueston, secretary. Organized 1901, with capitalization \$3,000,000, shares \$10 par, to sell stock. Property considered promising, but company not.

NEW-YORK CANADIAN COPPER CO., LTD.

ONTARIO.

Presumably dead, as company was in financial straits, 1905, and property, the Tip Top mine, is owned by Col. S. W. Ray, 1906.

NEW YORK COPPER MINING & SMELTING CO.

ARIZONA.

Letter returned unclaimed from former office, Tucson, Ariz. F. H. Lee, president; E. J. Tripple, secretary; H. Buehman, treasurer. Lands were 6 claims, in the Helvetia district, Pima county, on which a little prospecting has been done.

NEW YORK MINE.

ARIZONA.

Office and mine: care of T. R. Nellis, owner, Williams, Coconino Co., Ariz.

NEW YORK MINE.

ARIZONA.

Office: care of Henry J. Bennett, owner, Phoenix, Ariz. Mine office: Morristown, Maricopa Co., Ariz. Has a 100' shaft, on a 3' vein, also a 15' vein said to give assays up to 60% copper.

NEW YORK & MONTANA COPPER MINING CO.

MONTANA.

Office: 32 Broadway, New York. Mine office: Corbin, Jefferson Co., Mont. J. H. McCabe, general manager; E. J. Mathews, superintendent. Organized 1903, under laws of Delaware, with capitalization \$1,000,000, shares \$1 par. Lands, circa 250 acres, including the Erickson, Scioto and Copper Gulch groups, opened by 3 two-compartment shafts, which are said to make a good showing of medium-grade ore. Presumably idle.

NEW YORK & NEVADA COPPER CO.**NEVADA.**

Liquidated, 1905. Fully described in Vols. III and IV.

NEW YORK-SEATTLE COPPER MINING CO.**WASHINGTON.**

Office: 237 Broadway, New York. Mine office: Index, Snohomish Co., Wash. Harry D. Cowden, president; Philip Hingston, treasurer; R. H. Hingston, superintendent. Organized August 17, 1901, with capitalization \$1,000,000, shares \$1 par. Lands, 8 claims, area 160 acres, well timbered and watered, with an available water-power, 13 miles from the Great Northern railroad, with a good wagon-road between, in the Mineral City and Silver Creek districts. Mine is developed by a 212' shaft and circa 1,250' of tunnels, showing 4 veins, of 4' to 20' average width, carrying copper ore, presumably with gold and silver values, that has given average returns of \$14.42 per ton, in mill tests. Equipment includes a hydraulic power installation, air-compressor and sawmill, and, early in 1906, plans were being drawn for a 100-ton concentrator. Management seems to be developing the property vigorously, and the mine was being worked double-shift, at last accounts.

NEW YORK & VIRGINIA COPPER CO.**VIRGINIA.**

Office: 31 Nassau St., New York. Mine office: Woltz, Carroll Co., Va. Ambrose C. Dunn, president and general manager; Wm. D. Boggs, secretary and treasurer; James Lawson, superintendent. Organized 1901, under laws of West Virginia, with capitalization \$2,500,000, shares \$1 par. Lands, 740 acres, showing 7 cupriferous fissure veins and 2 gold veins, with 2 copper veins developed by shafts of 372' and 381' and by two tunnels of 100' each. Main vein is claimed by company to average 96' width, and to show argentiferous melaconite, bornite and chalcopyrite, carrying 10% copper, 25 oz. silver and 1 oz. gold per ton, which is more than the facts warrant. Has steam power. Claims to have about 40,000 tons of smelting ore on the dumps, with a larger amount blocked out for stoping. Presumably idle.

NEW ZEALAND COPPER ESTATES, CO., LTD.**NEW ZEALAND.**

Moribund.

NIAGARA COPPER CO.**ARIZONA.**

Office and mine: Prescott, Yavapai Co., Ariz. Herman Voge, president and general manager; John P. Bauder, secretary. Lands, 7 claims, in the Copper Creek district, near the Hillside property, 25 miles southwest of Prescott, opened by shafts of 60', 60' and 125', also several tunnels, showing a vein of 50' to 150' width, with footwall and hanging-wall paystreaks that have given assays up to 54% copper, 9 oz. silver and \$1.65 gold per ton. Property considered promising.

NIAGARA MINING & DEVELOPMENT CO.**BRITISH COLUMBIA.**

S. Arden Singlehurst, manager, at last accounts. Lands are in Kitsalas Cañon, on the Skeena river, in the extreme northern part of British Columbia, near the Alaskan line. Presumably idle.

NIAGARA MINING & SMELTING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Is controlled, through ownership of majority of stock, by United States Mining Co., which operates the mine.

NIBLACK COPPER CO.**ALASKA.**

Offices: 310 American Trust Bldg., Cleveland, Ohio, and 29 University Bldg., Milwaukee, Wis. Mine office: Niblack, Prince of Wales Island, Alaska. M. P. O'Brien, president and treasurer; F. B. Richards, vice-president; S. C. Vessy, secretary; Benedict Crowell, consulting engineer; Burton B. Nieding, general manager; Wm. N. Fink, engineer. Organized October 12, 1904, under laws of Arizona, with capitalization \$250,000.

The geology of this property is similar to that of the Ketchikan district, on the mainland, showing sedimentary deposits, mainly limestone of Devonian or Silurian age, having a general dip to the southwest, with intrusions of later eruptive rocks, that have forced their way between the beds, and altered them to such an extent that identification is difficult. The greenstone, in various phases of alteration, carries a mineralized zone parallel to the fault planes, with ore-bodies having a general strike of northwest to southeast, with dip of circa 60° to southwest. The principal ore body is a lense in greenstone, having a width of 60', with another ore body on the 160' level, estimated at 20' width, and a third lense outcropping on the mountain above the mine. Ore is chalcopryite, averaging circa 4% copper, and high in iron and sulphur, with combined gold and silver values of about \$1.50 per ton, carrying circa 25% iron, 25% sulphur and 30% silica. Property also shows covellite and chalcopryite, in quartz-sericite schists, at present undeveloped.

The lands are heavily timbered, and have a lake capable of developing 2,000 to 3,000 h. p., under a working head of 290'. Equipment includes a steam hoist, good for 1,000', and a 6-drill air-compressor. Buildings include a power-house, machine-shop, carpenter-shop, smithy, office, general store, boarding-house and sundry cabins for the miners. Large ore-bunkers, near the shaft, are connected by tramway with a 700' wharf. Tramway and wharf are double-tracked, and the tram is operated by gravity. The wharf is on Niblack Anchorage, a nearly landlocked harbor having deep water, but high tides, necessitating a long wharf, which is built with pockets, similar to those at the great iron shipping ports of Lake Superior.

The company has contracted to furnish 50,000 tons of ore to the Tacoma Smelting Co., but owing to insufficient shipping facilities, forwarded only 10,209 tons during 1905, giving an estimated output of 850,000 lbs. fine copper. A freight-rate of \$1 per ton, to Tacoma, has been secured, which is a very favorable figure for a distance of 600 miles, along the inside passage, the Niblack Copper Co. having been the first Alaskan mine to make regular contracts, with a transportation line, for a set ore tonnage of large volume.

NICHOLS CHEMICAL CO.**QUEBEC & NEW YORK.**

Office: 25 Broad St., New York. Mine office: Capelton, Sherbrooke Co., Quebec. Works office: Laurel Hill, N. Y. Employs 250 men. W. H. Nichols, president; J. B. F. Herreshoff, vice-president; J. M. Luther, secretary; E. R. Nichols, treasurer; S. L. Spofford, mine manager.

The mine, at Capelton, area 640 acres, carries lenses of chalcopryite and iron pyrites, former averaging 5% copper and latter 38% sulphur. Development is by 6 shafts, 4 of which are of less than 500' depth, one of 800' and one

of 2,000' depth, with circa 5 miles of underground workings. The mine has steam power, a 150-ton concentrator and a smelter, latter turning out 50% matte, when working.

The Laurel Hill works include a smelter and electrolytic refinery, using steam and electric power. Material treated is mainly ores and mattes from outside producers, in the smelting works, and western blister copper in the electrolytic plant. The works have 10 reverberatory furnaces, taking 40-ton charges, with hearth-linings of quartz sand, containing a small quantity of feldspar. Each reverberatory furnace heats a tubular boiler with waste gases. The plant has two 46x120" Herreshoff water-jacket blast-furnaces, of 210 tons daily capacity each. Matte and slag flow, in an uninterrupted stream, to a large settler, whence slag skims into pots, and the matte is tapped off into an iron bed. Fuel charges average 14%. Waste gas passes into a 1,000' main flue, of iron and brick, leading to a 300' chimney. About 100 tons of flue-dust are recovered monthly, and are briquetted and resmelted. The first-fusion product is a matte containing 40% to 60% copper, circa 20% iron and 20% to 40% sulphur. Matte is resmelted in water-jacket blast-furnaces, with 9% coke charges, and the product is tapped into converter shells, 12 in number, with 4 stands, tilted by hydraulic accumulators. Linings are made of 85% crushed quartz and 15% clay, ground and mixed in 3 silica mills with revolving bottoms, linings being tamped by hand, to a thickness of 18". The linings last from 10 to 16 blows, and the shells vary in capacity, according to state of linings, from 2 tons to 6 tons each. The converter blast, at only 8 to 10 lbs. pressure per square inch, is furnished by 100-h. p. and 120-h. p. Connorsville blowers. The final converter product is blister copper, assaying 99% to 99.5% copper, 50 oz. to 100 oz. silver and 1 oz. to 2 oz. gold per ton. Anodes are cast by a Herreshoff casting-table with 9 moulds, and after electrolytic refining, cathodes are melted down in 8 reverberatory furnaces, taking charges of 30 to 45 tons each.

The electrolytic plant is operated on the series system, with a current of 800 amperes, at 155 volts, generated by 17 dynamos. Anodes are cast $\frac{1}{2}$ x16x59", with an average weight of 67 pounds, and are smoothed by passing between rolls, after casting. The final product is cast mainly into wire-bars, in moulds which are painted with a mixture of lampblack and benzine after each casting. This company enjoys a deservedly high reputation for the purity of its product, and the efficiency of its metallurgical practice.

NICKEL-COPPER CO.

ONTARIO.

Office: Worthington, Ont. Lands are in Drury township near Sudbury, Algoma, Ontario. Experimented with a new process of reducing nickel-copper ores, with the usual result of failure. Affairs were botched by management, but property is considered promising. Idle for several years.

NICKEL PLATE MINE.

BRITISH COLUMBIA.

Mine office: Hedley, Yale district, B. C. A. Munson, manager. Ores carry gold, silver and copper. Has water and electric power and a 40-stamp mill. A very promising property, but is primarily a gold and silver mine, the copper values being small.

NICKELS COPPER CO.

Incorporated May, 1905, under laws of Maine.

NIGHT HAWK MINING CO.

WASHINGTON.

Office: 201 Uihlein Bldg., Milwaukee, Wis. Mine office: Loomis, Okanogan Co., Wash. Edwin Reynolds, president; H. D. James, secretary and general manager; Chas. A. Druse, treasurer; preceding officers, P. Meehan, A. W. Schweder, and Edward Kolb, directors; Chas. T. Peterson, superintendent. Organized 1901, under laws of Montana, with capitalization \$5,000,000, shares \$1 par. Lands, 55 full and 10 fractional claims, area circa 1,250 acres, also 150 acres miscellaneous lands, including a millsite and townsite, on Mount Ellemeham, in the Wannicut Lake district, 68 miles from a railroad, lack of which has greatly hampered development, but it is expected the Victoria, Vancouver & Eastern Railroad will pass through the company's holdings. Development is by 3 shallow shafts and 4 tunnels, longest 1,200'. Property shows numerous fissure veins, of which 5 have been more or less developed, these ranging 6' to 10' in width, and carrying estimated average values of 8% copper and 1 oz. gold per ton, which probably is an excessive estimate. Property is considered promising.

NIPPER CONSOLIDATED COPPER CO.

MONTANA.

Lands sold, 1906, to Butte Coalition Mining Co.

NIPPER MINE.

MONTANA.

Owned by Butte Coalition Mining Co.

NISHINOKAWA MINE.

JAPAN.

Mine office: Oboki-mura, Nii-gori, Iyo, Japan. Ores are chalcoppyrite, associated with iron pyrites, hematite, magnetite and sphalerite, in a quartz gangue, averaging 3% to 4% copper and occurring as lenses 3' to 12' thick, in quartz-schists. Production, 1900, was 183,415 lbs. fine copper

NIZINA GOLD & COPPER CO., OF ALASKA.

ALASKA.

Office: care of S. Thornton Langley & Co., Seattle, Wash. Lands, 25 placer gold claims and 7 copper claims, on the Nizina river, a tributary of the Copper river, Alaska, showing native copper. Property may prove valuable, if properly developed, but was lied about shamefully, in the advertisements of its fiscal agents, when peddling stock. Presumably idle.

N'KANDHLA SYNDICATE, LTD.

ZULULAND.

Offices: 1, Great Winchester St., London, E. C., Eng. A. Lee, secretary. Organized March 13, 1902, with capitalization £2,000, shares £1 par; issued, £1,800. Property is prospecting rights over 4 blocks, each 600 yards square, on the Umhlatuzi river, N'Kandhla district, Zululand. Moribund.

NOBLE MINING & MILLING CO.

MONTANA.

Office: 209 Railway Exchange Bldg., St. Louis, Mo. Mine office: Sheridan, Madison Co., Mont. S. M. Kennard, president; J. H. Wyeth, secretary and treasurer; D. H. Noble, general manager. Organized 1887, under laws of Montana, with capitalization \$2,000,000, shares \$10 par. Lands, 7 claims, area 75 acres, patented, also a 20-acre millsite, in the Wisconsin district, show a country rock of gneiss, carrying silicious sulphide ores, of which two 4' veins are developed by a 200' shaft, and by tunnels of 160', 200', 333' and 2,150',

showing ores averaging 1.5% copper, 10 oz. silver and \$60 gold per ton. Equipment includes a small hoist and a 2-drill Ingersoll-Sergeant air-compressor. Has a small concentrator and a 10-stamp mill. Property said to have been leased by the company to an independent operator.

NOGALES COPPER CO.

ARIZONA & MEXICO.

Reorganized, 1904, as Black Mountain Mining Co.

NOME-MONTANA-NEW MEXICO MINING CO.

NEW MEXICO.

Office: 415 Iron Blk., Milwaukee, Wis. Jas. M. Kerr, president. Claimed in advertisements to have gold property at Nome, Alaska, copper claims adjoining the Copper Cliff mine in Montana, and 60 acres of copper lands in the Bromide district of the Rio Arriba county, New Mexico. A little work has been done on the New Mexico claims. Regarded with suspicion.

NONESUCH MINE.

MICHIGAN.

Office: care of Arthur K. Camp, 78 Prospect Ave., Milwaukee, Wis. A. K. Camp and M. P. O'Brien owners. Lands, 640 acres. Is under option to the Calumet & Hecla Mining Co. Is the pioneer and principal mine of the Porcupine Mountain district of Ontonagon county, Michigan. Total production, 182 tons, 1,072 pounds fine copper. Mine carries native copper freely in an argillaceous conglomerate-sandstone. Idle for many years, but it is planned to test the lands by diamond drills during 1906. Very fully described in Vol. II.

SOCIEDAD FRANCESCA DE MINAS y

ARGENTINA.

FUNDICION DE NONOGASTA.

Mine office: Nonogasta, Rioja, Argentina. Property includes the Andueza, Santo Toribio and other mines, the ores of the Andueza being claimed to average 5% to 7% copper, 30 oz. silver and 2 oz. gold per ton. Has steam power and a small smelter.

NORMANBY SYNDICATE.

AUSTRALIA.

Mine office: Mt. Perry, Tenningering, Queensland, Australia. Lands, 240 acres, freehold. Vein is parallel to that of the Mt. Perry mine, with similar geological conditions, and is opened to a depth of about 200'. Ore, averaging about 13% copper and 10 dwts. to 15 dwts. gold per ton, is sent to the Aldershot smelter for reduction. Under lease, expiring June, 1907, to Queensland Copper Co., Ltd.

**NORMANTON-CLONCURRY RAILWAY &
COPPER MINES, LTD.**

AUSTRALIA.

Title changed, 1902, to North Queensland Railway Co., Ltd.

NORSK-BELGISK MINEKOMPANI.

NORWAY.

Mine office: Melhus, Flaa sogn, Norway. Lands are in the Røros district, and company was working a fahlband, in a small way, at last accounts.

NORTH AMERICAN COPPER CO.

WYOMING.

Was succeeded, September, 1904, by the Penn-Wyoming Copper Co., for which stock was exchanged by some of the shareholders. All assets of the North American Copper Co. were pledged, as security for a large indebtedness, to the International Trust Co., of Denver, presumably acting as trustee, and, on December 15, 1904, were sold by the trust company, for a sum much less than

the principal and interest of its debts. Sundry shareholders, who did not secure Penn-Wyoming stock in exchange, have brought suit against the Penn-Wyoming company, alleging collusion and fraud.

NORTH AMERICAN EXPLOITATION CO.

ARIZONA & MONTANA.

Office: care of Western Trust & Guaranty Co., 327 New York Life Bldg., Chicago, Ills. William R. Everett, president; Chas. W. Cheney, vice-president; Davis Ewing, secretary; Western Trust & Guaranty Co., treasurer; Frank F. Day, managing director; Frank A. Summerilh, assistant general manager; Emery W. Fisher, general mine superintendent. Capitalization \$10,000,000, shares \$1 par. Controls, or did control, under lease, the Rambler Mining & Smelting Co., of Wyoming, Mormon Girl Mining Co., of Arizona, Bradshaw Mining Co., of Arizona, and sundry gold mining companies. The North American Exploitation Co. claimed to own 54% of the Rambler stock 91% of the Bradshaw and 96% of Mormon Girl stock. Company has sold stock on a special repayment contract, alleging that under these terms investments will be repaid in full, with interest, and that the stock is certain to advance immediately upon the installation of smelters. The plan of promotion is a self-evident delusion, as no corporation, even those of the most philanthropic intent, sells stock that is backed by a thoroughly sound guaranty. Stockholders must take their chances, and a guaranteed stock always should be viewed with distrust. Company claimed, in an advertisement, March, 1906, to have 40,000 tons of ore developed, ready for smelting, and to plan installing copper furnaces, of same patent design, at each property, in the near future, notwithstanding which the Mormon Girl property, controlled by this company, was sold for debt, early in 1906, this property bringing the truly magnificent price of \$400, cash, at sheriff's sale. Company is regarded with deep suspicion.

NORTH AMERICAN EXPLORATION CO.

ARIZONA.

Mine office: Gilbert, Yavapai Co., Ariz. Geo. W. Middleton, superintendent. Ores carry gold and copper. Has gasoline power.

NORTH AMERICAN MINING CO.

NEW MEXICO.

Office: 615 Commercial St., Shamokin, Pa. Mine office: Lordsburg, Grant Co., N. M. Thos. A. Lister, president and general manager; W. P. Caldwell, secretary; W. E. Hoskin, superintendent. Organized under laws of New Mexico, with capitalization \$1,200,000, shares \$2 par. Lands, 11 claims, area circa 190 acres, in the Virginia district, including the Cobra Negra group, carrying fissure veins in porphyry, showing argentiferous oxide, carbonate and sulphide ores, giving assays of 18% copper, 15 oz. silver and \$10 gold per ton, developed by a 178' shaft. The Robert E. Lee mine is claimed to show argentiferous bornite at a depth of 60'. Ore bodies are stated, by a person not connected with the company, to carry flakes of native copper, in absolutely unpayable percentages. Equipment includes steam power, mine buildings and 4 dwellings. Railroad is 4 miles distant. Company is said to plan shipping, during 1906.

NORTH AMERICAN MINING CO.

OREGON.

Office: care of D. W. C. Nelson, secretary and general manager, Baker

City, Ore. Mine office: Burkemont, Baker Co., Ore. Samuel Clough, president; W. G. Sanderson, vice-president and superintendent. Organized 1898, with capitalization \$500,000, shares \$1 par, and reorganized 1905, when old management was eliminated.

Lands, 807 acres, also 920 acres miscellaneous lands, in the Burkemont district, carrying a mineralized zone up to 500' in width, opened by numerous pits and trenches, with an incline shaft, claimed by old officers to be 300' in depth, but which apparently has shrunk to a depth of 180' under the new management, and which the latter plans sinking to 500' depth. Property shows sulphide ores assaying up to 10% copper, with gold and silver values, and a little native copper. Equipment includes a first-motion hoist and small air-compressor. The old management lied atrociously in its advertisements, but new officials apparently had no connection with the old.

NORTH AMERICAN PROSPECTING & MINING ASSOCIATION.

COLORADO.

Office: 405 Temple Court Bldg., Denver, Colo. Mine office: White Pine, Gunnison Co., Colo. Chris. C. Sierk, president and general manager; Jas. T. Chase, secretary; Daniel C. Tobin, superintendent. Lands, 60 acres, showing 7 contact veins, between limestone and shale, giving average assays of 2% copper, 25% lead and 20% zinc, from carbonate and sulphide ores. Has water power and a small concentrator, making 55% zinc concentrates and 55% lead concentrates, carrying copper and gold values, when working. Presumably idle.

NORTH ARKANSAS ZINC, LEAD, COPPER, SILVER & GOLD MINING CO.

ARIZONA, ARKANSAS & CALIFORNIA.

Office: 380 Wilcox Bldg., Los Angeles, Cal. J. M. Graybill, president and general manager; M. H. Wells, secretary; J. H. Arbuckle, superintendent. Is commonly known as the Five Metals Co. Organized 1902, with capitalization \$5,000,000, shares \$1 par. Lands, 25 claims, area 500 acres, 18 miles east of Randsburg, in the Spangler district of San Bernardino county, California, sun-dry claims near Morristown, Maricopa county, Arizona, and 800 acres of undeveloped zinc lands near Mt. House, Baxter county, Arkansas. Is idle, and without funds, but it is reported by management to be free from debt.

NORTH BINGHAM MINE.

UTAH.

Said to be under bond to Samuel Newhouse.

NORTH BUTTE MINING CO.

MONTANA.

Office: 508 Lyceum Bldg., Duluth, Minn. Mine office: Butte, Silver Bow Co., Mont. Employs 600 men. Jas. Hoatson, president; Chas. A. Duncan, vice-president and treasurer; Jos. Cotton, second vice-president and solicitor; preceding officers, Wm. J. Olcott, John Uno Sebenius, Chester A. Congdon, James Gayley, Thomas F. Cole and Daniel Clemson, directors; Frederic R. Kennedy, secretary; Arthur C. Carson, general manager. Organized April 5, 1905, under laws of Minnesota, with capitalization \$9,000,000, shares \$15 par; issued, \$6,000,000. Paid, during 1905, two dividends, aggregating \$500,000, and in March, 1906, paid dividend No. 3, of \$500,000. Mine properties were bought for cash, at a cost of \$7,035,495.71. American Loan & Trust Co.,

Boston, transfer agent; Old Colony Trust Co., Boston, registrar. Shares are listed on the Boston Stock Exchange.

Lands, lying near the Anaconda and Boston & Montana mines, include the Speculator mine, a fractional claim, also the Edith May, Jessie, Copper Dream, Miners Union, Berlin, Gustavus and Margaretha mines and claims. All ore is raised through the Speculator shaft, and the mines are connected underground with the Anaconda. Operations are largely on the Jessie and Edith May mines, the property carrying the vein for a distance of about one half-mile on the Edith May and Miners Union claims. The ore as produced averages 8% in copper tenor, which is much the best average value secured by any important mine in the Butte district, and some ore averaging 14% copper is produced.

The Speculator had an old working shaft of 1,700' depth, which will be sunk to the 1,800' level, as soon as the new hoist is installed, and eventually will be sunk still deeper, recent developments having proven the continuance of high grade ore in the adjoining Anaconda mine, to a depth of at least one-half mile. The old shaft when taken over by present company, April, 1905, was found in bad condition, and was cut down and entirely retimbered, in 19 weeks, which was very quick work. During the time the Speculator shaft was being retimbered, ore was hoisted through the High Ore shaft of the Anaconda, production necessarily being curtailed to a considerable extent. The Speculator shaft has 3 compartments, with a 127' steel gallows-frame, and is to have a 32x72" Nordberg hoist, good for 3,500' depth, raising 4-ton skips dumping automatically at surface, saving much unnecessary handling. Additional boiler capacity will be given, and a 40-drill air-compressor is to be installed also, during 1906.

The Jessie mine has an old and idle 500' shaft, and extraction is through a crosscut on the 1,600' level of the Speculator shaft, but this property will be reached by crosscuts on the 1,000' and 1,200' levels in a short time. The 1,600' level shows a 15' vein of high average tenor, and the 1,700' level shows a continuance of the same ore body, with a paystreak of chalcocite averaging 17% copper.

The Edith May mine is opened by crosscuts from the Speculator, on the 1,000', 1,200' and 1,600' levels, showing a vein of 18' to 24' width, of good average grade.

The Miners Union claim has a 300' drift on the 1,600' level, reached from the Speculator, via the Edith May mine, showing a fine body of high-grade ore.

The Ground Hog mine shows ore in the drift from the 1,600' level of the Jessie, and it is to be developed extensively. The Adirondack mine had a 500 shaft when bought by the North Butte, and presumably will be opened by crosscuts from the Speculator shaft.

The Berlin mine has a 400' shaft.

A 3-year contract was made, 1905, for smelting the entire production of the North Butte, at the Washoe works of the Anaconda, the Anaconda company making cash settlements, on or before the 15th day of each month, for the net value of all ores received during the preceding month. Relations be-

tween the North Butte and the Amalgamated interests are very friendly, and are on a mutually satisfactory and profitable basis. It would have been impossible for the North Butte to have begun production on a considerable scale, immediately after the purchase of the property, but for the smelting arrangement entered into with the Anaconda.

Production, for calendar year 1905, was 22,607,978 lbs. fine copper, but the company was in existence for less than 9 months of 1905, and for the fiscal year, ending March 31, 1906, production was 30,954,788 lbs. fine copper. In April, 1906, the property was hoisting circa 900 tons of ore daily, and the new equipment will permit an increase to about 1,500 tons daily, hence, before the close of 1906, the North Butte should be on a productive basis of nearly or quite 50,000,000 lbs. fine copper yearly. For the first fiscal year, the company produced copper at a cost of slightly more than 7 cents per pound, giving the North Butte the cheapest cost, and consequently the largest profits per pound, of any Montana mine.

The North Butte is, without a doubt, the most sudden and spectacular success ever known in copper mining, and the development and production secured during its first year are little short of marvelous. The company was promoted on a cash basis throughout, and on a plan absolutely fair to every shareholder. The management includes the highest technical ability, and is a financial and metallurgical prodigy deserving unqualified commendation.

NORTH BUTTE MOUNTAIN COPPER CO.

MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Organized April, 1906, under laws of Montana, with capitalization \$5,000,000. Lands are sundry newly located claims, north and west of the Butte & Bacorn, north of Walker-ville.

NORTH CAROLINA MINE.

NORTH CAROLINA.

Owned by Fentress Mining Co.

NORTH CAROLINA MINING CO.

NORTH CAROLINA.

Property is the Everett mine, in the Smoky Mountains, Swain county; North Carolina, extensively opened by tunnels. W. S. Adams, general manager. Ore is mainly chalcophyrite, with some melaconite and a little native copper, said to average about 6% in copper. Has a good power plant, with boilers, pumps, 4-drill Rand air-compressor, etc., and a number of good buildings. Lands include a good smelter-site, and a fine water power is available for development. Company in litigation and property idle, at last accounts.

NORTH CAROLINA & VIRGINIA

NORTH CAROLINA & VIRGINIA.

DEVELOPMENT CO.

Mine office: care of W. E. Morong, Virgilina, Halifax Co., Va.

NORTH CERRO MURIANO COPPER MINING CO., LTD.

SPAIN.

Offices: 6, Queen Street Place, London, E. C., Eng. Mine office: Estación de Cerro Muriano, Córdoba, Spain. Lord Vaux, chairman; F. H. Williams, secretary; Henry F. Collins, general manager, acting for John Taylor & Sons; Richard E. Carr, agent. Organized March 8, 1906, with capitalization £250,000, shares £1 par. Lands, 150 hectares, area 387 acres, held from the Spanish government. Lands adjoin the property of the Cerro Muriano Mines,

Ltd., and include a number of old workings, presumably dating from Roman times.

NORTH COAST COPPER CO.

WASHINGTON.

Office: Everett, Wash.

NORTH CROWN LYEELL MINE.

TASMANIA.

Lands sold to Mt. Lyell Mining & Railway Co., Ltd.

NORTHEAST BUTTE COPPER MINING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Organized April, 1906, with capitalization \$1,000,000. Lands are sundry newly located claims, north and west of the Butte & Bacorn.

NORTHERN CALIFORNIA INVESTMENT CO.

CALIFORNIA.

Owens the Black Diamond group, in the Stillwater district of Shasta county, California. Geo. Bayha, vice-president and general manager. Has large holdings, on which several low-grade ore bodies of considerable size have been located. Idle at last accounts.

NORTHERN COPPER (B. S. A.) CO., LTD.

RHODESIA.

Offices: Salisbury House, London, E. C., Eng. Mine office: Bulawayo, Rhodesia, South Africa. Lord Gifford, V. C., chairman; preceding officer, E. Davis, H. Wilson Fox and P. C. Tarbutt, directors; Bechuanaland Exploration Co., Ltd., manager in South Africa; Percy Tarbutt & Co., consulting engineers; Thos. D. Davey, resident engineer; Tom Donald, secretary. Organized Feb. 16, 1895, under name of Northern Territories (B. S. A.) Exploring Co., Ltd., changed June, 1899, to present title, with capitalization £250,000, shares £1 par; issued, £178,000. Debentures, £45,900 outstanding, at 6%; issued 1903, redeemable at £105, December, 1908, and convertible, when fully paid, into £10 shares, on one month's notice, in writing.

Lands, originally were 500 square miles, near the Zambesi river, also 12,000 acres of coal lands and 220 gold claims in the Umnati and Guay districts, but 500 square miles were sold to the Rhodesia Copper Co., leaving 5 blocks of 10 square miles each, on either side of the northern reach of the Kafue river, scattered over an area of 160 miles east and west by 100 miles north and south. Lands include the Silver King, Sable Antelope, North Star, Maurice Gifford, True Blue, Wonder Rocks, Crystal Jacket, Blue Jacket, Bob, Lou-Lou, Sugar Loaf, Lishambika, Inyarka, Kwemba, Hippo, Bwana M'Kubwa and Beehive, in the main concession, also the Chanobi concession of 10 square miles, southeast of the main concession. Of the 11 so-called mines, but 3 are really worthy the name, these being the Chanobi, Silver King and Sable Antelope, the two latter being small, pockety mines.

The principal copper deposits so far located are at and near sundry ancient workings, located in a belt of limestone, about 10 miles wide, running nearly north and south for almost the entire length of the concession. The limestone belt is flanked and sometimes intruded by talcose, quartzose and micaceous schists, and by granite, feldspar and quartz-porphyrines, the copper occurring as irregular deposits in limestone, and in veins traversing schists, with oxidation at surface, the predominant ores being tetrahedrite and chalcocite, with occasional bornite and chalcopyrite, the ores in schists being more highly

oxidized than those in limestone. The company has secured ores in greater or less quantities, ranging from 2.5% to 50% copper tenor, and also has ores of lead and zinc, sundry gold claims and a 12" to 24" seam of bituminous coal, with indications of the existence of larger and better grade coal measures.

The company's main camp is at the Silver King mine, in south latitude 14° 36' 11" and east longitude 26° 55', twelve miles south of the northerly reach of the Kafue river. The main shaft is 205' deep, the ore body, which apparently is a lense, pinching out before the bottom of the shaft was reached, with the possibility that other lenses will follow.

The Chanobi mine, 45 miles from the Silver King, has 5 shafts on 4 separate outcrops. No. 1 shaft is 100'; No. 2 outcrop has a north shaft of 92' and a south shaft of 98', latter showing favorable copper values at bottom; No. 3 outcrop has a 78' shaft showing chalcopryite and occasional chalcocite; No. 4 outcrop shows copper carbonates on surface. Apparently the various outcrops are of the same small sulphide vein. The Chanobi has a warehouse, and a compound for native workmen.

The Sable Antelope has 3 shafts, showing high-grade chalcopryite in a vein of 20' width, on the 50' level.

The Hippo mine has a 99' shaft, showing from depth of 34' to 99' a good vein of 4' 8" average width, assaying 21.36% copper and 2.4 dwts. to 13 dwts. gold per long ton. A second shaft, of 100', seems not to have developed anything of especial promise.

The Bwana M'Kubwa mine, located circa 90 miles north of the Rhodesia Broken Hill mine, shows 2 parallel veins, traced nearly a half mile, of which one vein, opened by a 150' shaft, ranges 30" to 5' in width, and gives assays of 14.5% to 19.7% copper.

The True Blue mine has steam power and a pump. The Sugar Loaf mine has an immense ore outcrop standing 120' high, and a tunnel showing a considerable body of low-grade copper ore. No. 3 shaft of the Blue Jacket mine, 138' deep, shows carbonate copper ores and chalcopryite.

Transportation to and from the nearest railroad is by traction engines, and the railroad is to reach the Kafue river eventually, and probably will touch the mines. Mr. Davey, in personal charge of the mines, has secured the confidence and good-will of the natives, which counts for much, in the interior of darkest Africa. The management seems good, and some of the copper properties are considered promising, but further extensive development will be required before the company can become a producer, with any reasonable degree of safety, none of the properties having been opened to sufficient depth to assure long life, or the existence of assured tonnage.

NORTHERN TERRITORIES MINES OF

AUSTRALIA.

AUSTRALIA, LTD.

Offices: Broad Street House, London, E. C., Eng. H. J. Nevill, chairman; T. I. Dyson, manager; H. Simpson, secretary. Organized Jan. 25, 1905, as a reconstruction of Northern Territories Mining & Smelting Co., Ltd., with capitalization £175,000, shares 10s. par; issued, £160,003.

Lands, 604 acres, 113 miles by rail from Port Darwin, in the Northern

Territories of South Australia. Has ores of copper, gold and silver, with a 40-stamp mill at the Howley mine, a 20-stamp mill at Yam Creek and a 20-stamp mill at Brock's Creek. Copper properties are known as the Mount Ellison and Iron Blow mines, former. which is very wet, being opened by a 143' shaft, giving assays up to 12% copper. The Iron Blow, main shaft 193', has a mining plant including air-compressor and ore-bins for shipping, also a smelter 1 mile distant, with tramway connecting. The smelter has 2 reverberatory furnaces, and a converter on the ground, but not erected. The smelter, blown in. 1904, in September treated an average of 66 tons of ore daily, producing 204 long tons of matte carrying 61 tons refined copper, circa 17,500 oz. silver and 350 oz. gold. Company and its several predecessors have struggled against financial difficulties from their inception.

NORTHERN TERRITORIES MINING &**AUSTRALIA.****SMEETING CO., LTD.**

Succeeded, Jan. 25, 1905, by Northern Territories Mines of Australia, Ltd.

NORTHERN ONTARIO COPPER CO., LTD.**ONTARIO.**

Office: Queen Street, Sault Ste. Marie, Ont. Mine office: Dean Lake, Thompson Twp., Algoma, Ont. Employs 12 men. J. H. Quimby president; A. C. Boyce, M. P., vice-president; Uriah McFadden, secretary and treasurer; John A. Montague, general manager. Organized January, 17, 1906, under laws of Ontario, with capitalization \$500,000. shares \$1 par. Lands, 280 acres, lying north of Dean Lake, showing two contact veins, between, slate and pyroxene eruptive rocks, of which one, opened by a 30' pit, averages 9' width, showing ore assaying 6.2% copper, 1 oz. silver and \$1.20 gold per ton. Has a 65-h. p. steam plant.

NORTHERN SIERRA MADRE MINING CO.**MEXICO.**

Mine office: Suaqui de Batuc, Sahuaripa, Sonora, Mexico. Is said to have two copper properties, known as the Reina de Cobre and Providencia, and a silver-lead mine, known as El Colosus, lying circa 25 miles west of Suaqui de Batuc.

NORTH FORK COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Battle, Wyo.

NORTH MOUNT LYEYLL COPPER CO., LTD.**TASMANIA.**

Absorbed, 1903, by Mt. Lyell Mining Co., Ltd.

NORTH PACIFIC MINE. "**MONTANA.**

Owned by Daly Mining Co.

NORTH PACIFIC MINING CO.**OREGON.**

Office: 29 Hinkley Blk., Seattle, Wash. Property, the Virginia group, in the Cascade Mountains, eastern Oregon, has a 30-stamp mill.

NORTH PLATTE COPPER MINING & SMELTING CO.**WYOMING.**

A swindle, perpetrated by S. F. Pusey. of Philadelphia. Lands claimed were in Converse county, Wyoming. Pusey was convicted, on a criminal charge, by the assistance of Prof. H. C. Beeler, State Geologist of Wyoming. James W. King has been appointed receiver for the company, though property scarcely seems worth the trouble of a receivership.

NORTH POLE MINING CO.**COLORADO.**

Office: Aspen, Colo. Mine office: Crystal, Gunnison Co., Colo. Employed 15 men, at last accounts. Jas. T. Stewart, chairman and general manager; Geo. N. Smalley, vice-president; W. Porter Nelson, secretary; Frank Meyer, treasurer; preceding officers, James R. O'Hara, Geo. H. Poor and A. T. Ferris, directors; C. Casagrande, mine superintendent. Organized 1902, under laws of Colorado, with capitalization \$500,000, shares \$5 par. Lands, 37 claims, area 370 acres, in the Rock Creek district, showing a limestone country rock, carrying 9 fissure veins, of which 3, under development, of 3' average width, have tunnels of 340', 680', 450', 300' and 600', with a total of 3,000' of openings, estimated to show 100,000 tons of ore, with 50,000 tons blocked out for stopping, ore being chalcopryite, giving average returns of 8% copper, 1.5% lead, 2% zinc, 8.75 oz. silver and \$1 gold per ton. Has a 50-h. p. steam plant, with a 7-drill Rand air-compressor, 15x30' machine shop, and several other small mine buildings.

NORTHPORT SMELTING & REFINING CO., LTD. BRITISH COLUMBIA.

Controlled and operated by Le Roi Mining Co., Ltd.

NORTH QUEENSLAND RAILWAY CO., LTD.**AUSTRALIA.**

Offices: 16, St. Helen's Place, London, E. C., Eng. Organized May 2, 1901, as Normanton-Cloncurry Railway & Copper Mines, Ltd., and name changed to present title July, 1902. Capitalization £50,000, shares £1 par; issued, £33. Property consists of the valuable idea of building a railway, carrying extensive mineral rights, in North Queensland, Australia.

NORTH STAR MINING CO.**MICHIGAN.**

Office and mine: 420 East McLeod Ave., Ironwood, Gogebic Co., Mich. Peter Lofberg, president; Adolf W. Peterson, secretary. Organized May 1, 1903, under laws of Michigan, with capitalization \$25,000, shares \$25 par. Lands, 240 acres, held under option, showing several cupriferous amygdaloids, on which a 60' exploring shaft was sunk and crosscuts started. Idle.

NORTH STAR MINING CO.**WASHINGTON.**

Office: 502 Mutual Life Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. J. F. Ronald, president; J. S. Chase, secretary; Edw. Ellis, general manager. Organized 1901, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Lands, 70 claims, area 1,200 acres, lying between the Ethel and Bunker Hill-Sullivan properties, showing a 4' vein, opened by tunnels of 200' and 600', with about 2,000' of underground openings, said to give average values of 10% copper, from bornite and chalcopryite. Also holds the Red Mountain group, in Chelan county Washington.

NORTH SHORE COPPER & SMELTING CO.**ONTARIO.**

Apparently fraudulent. Lands were in Aberdeen township, Algoma, Ontario.

NORTH STAR MINING & MILLING CO.**COLORADO.**

Property sold to Silverton Mining Co.

NORTH STATE GOLD & COPPER MINING CO.**NORTH CAROLINA.**

Mine office: Jamestown, Guilford Co., N. C. James Palmer, superin-

tendent, at last accounts. Has a vein of 2' to 25' width, carrying auriferous copper sulphides, opened to depth of circa 400'. Has steam and water power, 50-ton concentrator and a mill with 20 gravity stamps.

NORTH VERDE COPPER CO.

ARIZONA.

Office: 303-167 Dearborn St., Chicago, Ills. Mine office: Jerome, Yavapai Co., Ariz. W. P. Cooper, president; E. C. Weatherley, vice-president; John Tierney, general manager; J. J. O'Donohue, secretary and treasurer; J. F. Mowles, superintendent. Organized January, 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 6 claims, area 120 acres, contiguous to the United Verde mine, in the Black Hills district, opened by an 80' shaft, planned to be sunk to 500', and a 250' tunnel, latter showing calcspar, iron and soft rock, in a zone of circa 150' width, with a little ore carrying about 2.5% copper and 3 oz. silver per ton, with traces of gold. Equipment includes a 40-h. p. Fairbanks-Morse double-cylinder hoist and an air-compressor. Property is considered well located.

NORTHWEST COPPER CO.

BRITISH COLUMBIA.

Dead. Operated the Van Anda mine, 1901-1902.

NORTHWESTERN CONSOLIDATED LUMBER,

OREGON.

OIL & COPPER CO.

Office: care of Glenn M. Deuell, secretary, Grand Rapids, Mich. Dr. O. A. Lacrone, president and general manager. Lands supposedly in vicinity of Baker City, Oregon. Presumably idle.

NORTHWESTERN COPPER MINING CO.

WYOMING.

Office: 509 New York Life Bldg., Omaha, Neb. Mine office: Dillon, Carbon Co., Wyo. Chas. R. Courtney, president; W. D. Reed, vice-president; F. E. Brown, secretary and general manager; N. A. Kuhn treasurer; H. H. Roberts, secretary. Organized 1902, under laws of Wyoming, with capitalization \$100,000, shares 10 cents par. Lands, 15 claims, area 300 acres, including the Batchelder mine, in the Battle Lake district, lying circa one mile west of the Ferris-Haggarty mine of the Penn-Wyoming Copper Co., carrying about one mile of the strike of a vein of 10' to 50' width, apparently a continuation of the Ferris-Haggarty vein, opened by a shaft of circa 100', showing oxide, carbonate and sulphide ores, mainly the latter, of concentrating grade, assaying 3% to 40% copper and \$2 to \$20 gold per ton. Mine has circa 1,000' of workings, and the building of a concentrator is being considered. Property is considered promising.

NORTHWESTERN SMELTING & REFINING CO.

BRITISH COLUMBIA.

Dead. Smelter sold, 1905, to Britannia Smelting Co., Ltd.

NORTHWEST GOLD & COPPER CO.

OREGON.

Mine office: Sumpter, Baker Co., Ore. Lands include the Colorado claim, in the Cracker Creek district, said to show a 40' vein.

NORTHWEST MINING CO.

WASHINGTON.

Letter returned unclaimed from former mine office, Kettle Falls, Wash.

NORTH WISCONSIN COPPER MINING CO.

WISCONSIN.

Succeeded, circa 1899, by Chippewa Copper Mining Co.

A. O. NORTON.**QUEBEC.**

Office: 286 Congress St., Boston, Mass. Mine office: Suffield, Sherbrooke Co., Quebec. Lands, 350 acres freehold and 150 acres mining rights, 7 miles from Sherbrooke, with railroads within 2 miles on either side. Property, known as the Suffield and King mines, in Ascot township, has a shaft of 165', with circa 900' of workings, on a vein of 8' to 9' average width, and a second shaft of 245' on a vein of 2' to 20' width, giving average assays of 6% copper, from nothing to 10% zinc, 10 oz. to 120 oz. silver and \$2.50 gold per ton. Equipment includes a prospecting outfit, with 2 hoists, pumps and 3 power drills. Property considered promising.

NORVELL-PICKRELL COPPER MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. J. S. Norvell, superintendent, at last accounts. Presumably idle.

NORWAY MOUNTAIN GOLD & COPPER**BRITISH COLUMBIA.****MINING CO.**

Office: care of Thomas & Co., fiscal agents, 503 Provident Bldg., Philadelphia, Pa. Agents sold stock on guarantee of dividends within one year, claiming to have copper lands in British Columbia. Apparently a deliberate swindle.

NORWEGIAN-AMERICAN COPPER MINING**NORWAY.****& SMELTING CO.**

Office: 1618 Milwaukee Ave., Chicago, Ills. Mine offices: 3 Fjordgaden, Trondhjem, Norway, and Goulasjok, Lyngenfjord, Norway. Employs 100 men. Adolph Larson, president; John Iverson, vice-president; Andrew J. Breda, secretary; Hakon Thompson, treasurer; Hans Boholm, general manager; D. Bryn and J. Johansen, superintendents; Harald Bodtke, engineer. Organized April 20, 1905, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par; issued, \$450,000. Annual meeting, first Monday in April.

Lands, 54 claims, in 5 groups, situated in 4 districts. Formation is much the same at the various properties, country rock being micaceous schists, of lower Silurian age, with eruptive greenstone conformable with the schists, ore bodies occurring as extended lenses, very persistent in strike and depth, on the contact of the schists with metamorphosed olivine gabbro. Ore is cupriferous iron pyrites, carrying 3% to 10% copper and 10% to 30% sulphur, with small gold and silver values.

The principal mines are the Fines and Tingstad, formerly belonging to King Christian Frederik of Denmark, and were worked 1765-1817, being closed down on account of Norway securing her first independence. These mines are circa 60 miles from Trondhjem, and about ½ mile from tidewater, lying in 2 different valleys of about 20 miles length, connecting with the Trondhjemsfjord, giving fine water transportation. The Fines mine is held under a contract, by which it can be bought for \$40,000 cash, or the same price in yearly installments, or can be operated on a royalty basis for 90 years. This mine carries a 5' vein, estimated to show 50,000 tons of ore averaging 6% to 7% copper. The Tingstad mine is held under a similar con-

tract, on the basis of \$45,000 cash, or a royalty of 35 cents per metric ton.

The company also has sundry claims, including the Lyngenfjord mine, on the Island of Vanden, 25 miles north of Tromsø, at the mouth of the Lyngenfjord, the mine having an aerial tram to Kaafjord. This mine is near tidewater that does not freeze in winter, and is favorably located for shipping.

The various lands of the company have several available water powers, and the company plans installing a concentrator and beginning shipments of cupriferous pyrites to Great Britain, before the close of 1906. Management seems honest, and property is considered valuable.

NORWEGIAN COPPER MINES, LTD.

NORWAY.

Dissolved, October, 1905.

NORWEGIAN EXPLORATION CO., LTD.

NORWAY.

Offices: 23, Leadenhall St., London, E. C., Eng. G. B. Mee, chairman, I. C. Ozanne, secretary; Organized Sept. 26, 1903, under laws of Guernsey, with capitalization £260,000, shares £1 par; issued, £119,259. Lands are 32 mining claims, at Vaddasguisa, Lankvarres, and Rojelguisa, in the Oxfjordalen, Norway.

NORWEGIAN OTTA COPPER CO., LTD.

NORWAY.

Offices: 371, Mansion House Chambers, London, E. C., Eng. Mine office: Aasoren, Gudbrandsdalen, Norway. S. P. Eastick, managing director; H. Duckworth, secretary; Organized Nov. 1, 1902, with capitalization £100,000, shares £1 par; issued, £75,287. Lands, 5 acres. Idle.

NORWICH MINE.

MICHIGAN.

Owned by Copper Crown Mining Co., of Michigan.

NOTAWAY GOLD & COPPER MINING CO.

COLORADO.

Office: Mining Exchange Bldg., Denver, Colo. Mine offices: Silverton, San Juan Co., Colo. and Central City, Gilpin Co., Colo. A. J. Vivian, president and general manager; Wm. Gelder, secretary. Capitalization \$1,000,000. Lands, 2 groups of claims, one in Gilpin county, and one in San Juan county, former having ores carrying gold, silver and copper, and being equipped with a steam plant. The San Juan group, on Sultan Mountain, is developed by a 400' tunnel, with considerable underground openings, and has electric power. Presumably idle. Apparently promoted mainly to sell stock.

NOVARA MINE.

ITALY.

An old and small mine, in the province of Piedmont, Italy.

SOCIEDAD NUESTRA SEÑORA DE LA SALUD.

SPAIN.

Office: Sevilla, Spain. Mine office: Chaparrita, por Rio Tinto, Huelva, Spain. Don Manuel Piérola y Orozco, manager. Lands include 11 mines, area 106 hectares. Secures a small production of cement copper from leachings of tereros.

COMPAÑIA MINERA LOS NUEVES.

SPAIN.

Letter returned unclaimed from former office, San Andres, 26, Madrid, Spain. Mine office: Tijola, Almeria, Spain. Idle for some years.

NUMBER 7 MINING CO., LTD**BRITISH COLUMBIA.**

Property, at Greenwood, B. C., sold to British Columbia Copper Co.

NYACK MINING CO.**ARIZONA.**

Absorbed by Anita Consolidated Copper Co., now Anita Copper Co.

NYMAGEE COPPER MINING SYNDICATE.**AUSTRALIA.**

Lands sold to Great Cobar Copper Mining Syndicate.

OAK HILL MINE.**CALIFORNIA.**

Office and mine: care of Henry Willey, Cooperstown, Tuolumne Co., Cal. Has a 112' shaft, with a few short drifts. Idle.

OAK HILL MINE.**NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. Is said to have a 7' vein, carrying bornite, covellite, and chalcopryite, averaging 18% copper. Idle.

OASIS GOLD & COPPER MINING CO.**UTAH.**

Office: care of Joseph A. Jennings, secretary, Salt Lake City, Utah. M. S. Browning, president; John T. White, vice-president; Joseph B. Toronto, treasurer; J. D. Clive, manager. Organized April, 1904, under laws of Utah, with capitalization \$250,000, shares \$1 par. Lands, sundry claims, in the Drum district, Juab and Millard counties, Utah, opened by a 185' shaft, showing 6 ore chutes, from which ore assaying 4.3% copper, 10 oz. silver and \$19.20 gold per ton, was shipped, 1904, to Salt Lake smelters.

OAXACA MINING, MILLING & INVESTMENT CO.**MEXICO.**

Office: Wilmington, Del. Mine office: Oaxaca, Oax., Mex. C. Arthur, manager. Property includes La Esperanza and other mines, carrying gold, silver copper, lead, and zinc ores. Has water power and a 10-stamp mill.

OAXACA SMELTING & REFINING CO.**MEXICO.**

Office: 514 Imperial Hotel, New York. Mexican general office: Edificio "La Mutua," Mexico, D. F. Works office: Oaxaca, Oax., Mexico.

OAXARNA GOLD MINING CO.**IDAHO.**

Owns entire stock issue of Seager-Coryell Gold & Silver Mining Co., Ltd.

OBIE MINE.**JAPAN.**

Mine office: Nakanosha-mura, Tsu-gori, Bitchu, Japan. Employs circa 1,000 men. T. Sakamoto, owner; K. Ogawa, manager. A very ancient property, having numerous 2' to 4' veins carrying chalcopryite, and small quantities of argentiferous galena, with quartz gangue, traversing clay-slate and granite. Has steam power and a good smelter. Production, 1899, was 1,316,745 lbs. fine copper.

CARRILO OCANA.**CHILE.**

Office and mines: Taltal, Antofagasta, Chile. Ramón A. Heredia and David B. Contreras, superintendents. Mines are La Liga, Estrella de Venus and La Gyacolda, carrying ores of gold, copper and silver. Has steam power and 4 Chilean mills, employing 60 to 75 men, at last accounts.

RAMÓN OCHOA.**MEXICO.**

Office and mine: Autlán, Jalisco, Mexico. Lands, 100 pertenencias, including the Comachin, Voluntin, Mogote and other mines, lying circa 28 miles east of Autlán. Properties show veins of 3' to 12' width, carrying cinnabar and auriferous and argentiferous chalcocite.

MINERAL DE COBRE LOS OCOTES, S. A.**MEXICO.**

Office: Oaxaca, Oax., Mex. Mine office: Ejutla, Oaxaca, Mex. Alfredo Oest, president and general manager; P. M. Zulper, vice-president. Organized Sept. 27, 1904, under laws of Mexico, with capitalization \$300,000, Mexican, shares \$1 par, full-paid. Lands, 44 pertenencias, area 110 acres, showing 4 fissure veins, of which one, under development, averages 6' width, carrying sulphide ores assaying 6.5% copper and 15 oz. silver per ton, with a trace of gold. Has 3 shafts, 2 of 100' each and 1 of 230', with about 1,600' of underground openings, estimated to show 12,000 tons of ore. Has steam, gas and electric power, and employs circa 75 men. In 1904 produced 290 tons of concentrates, carrying 121,000 lbs. fine copper and 16,700 oz. silver, reduced at the works of the Teziutlán Copper Co.

OCOTITLÁN MINE.**MEXICO.**

Owned by Mascota Copper Mining Co.

OCTAVIA MINING CO.**WYOMING.**

Mine office: Cambria, Wyo. David Jones, president. Lands, 54 claims, including the Straight Up group, near the head of Jack Creek, slightly developed by a 60' tunnel. Does assessment work only.

ODDIE MINE.**NORTH CAROLINA.**

Owned by Rowan Copper & Gold Mining Co.

O. G. COPPER CO.**NEW MEXICO.**

Full title is Old Governors Copper Mining & Smelting Co.

OGOYA MINE.**JAPAN.**

Mine office: Nishio-mura, Nomi-gori, Kaga, Japan. T. Yokoyama, owner and general manager. Discovered 1878. Ore is chalcopyrite, associated with melaconite, azurite, bornite, native copper and iron pyrites, with quartz gangue, in numerous veins traversing liparite. Three practically parallel veins main are worked, these ranging 1" to 4' in width, and 500' to 2,000' in length. Management is progressive. Has a modern mining and reduction plant, with water and electric power and a 30-ton smelter. Employs about 750 men. Production, 1899, was 1,015,759 lbs. fine copper.

OHIO & ARIZONA COPPER MINING & SMELTING CO.**ARIZONA.**

Corporation dissolved.

OHIO & COLORADO SMELTING & REFINING CO.**COLORADO.**

Office and works; Salida, Chaffee Co., Colo. Timothy Goodwin, general manager, at last accounts. Smelter is rated at 1,000 tons daily capacity, and is equipped with steam and electric power and a refinery.

OHIO COPPER CO.**UTAH.**

Office: Miamisburg, Ohio. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 100 men. Maj. H. G. Catrow, president and general manager; A. J. Bettles, vice-president; Henry Catrow, secretary and treasurer; M. Ziegler, general superintendent; Henry Varden, mine superintendent. Organized October, 1903, under laws of Utah, with capitalization \$1,000,000. Is operated as a close corporation. Property was under option, 1905, but was not sold.

Lands, 14 patented claims, area 120 acres, surrounded by holdings

of the Utah Copper Co., Boston Consolidated, United States, Fortuna and Copper Glance mines, in the Bingham division of the West Mountain district. Property was bought of the Columbia Copper Mining Co., for \$225,000, and is developed by several shallow shafts, deepest 145', showing an 8" streak of malachite, carrying 25% copper, and 30" of disseminated cuprite, averaging 5.12% copper. Principal development is by tunnels of 800' and 1,150', with upwards of one mile of underground workings. Principal ore body developed is a vein carrying disseminated chalcopryite, having a width of 30' on the 400' level. In addition to the veins, the property has a large body of monzonite, carrying a little under 2% copper, and the mine is estimated to show 1,000,000 tons of monzonite, with the likelihood that an enormous body of this grade of cupriferous porphyry can be developed by further work. The mine is operated through an 800' main crosscut tunnel, which intercepts the What Cheer and All's Well veins, lying 400' apart and parallel. The All's Well shows a 6' paystreak of 5% copper with small gold values, and a winze on the What Cheer vein shows 11' of rich sulphides. Ores, as shipped, have averaged circa 12% copper.

The property has a mill with 5 gravity stamps, and a 20-ton concentrator, both idle, and the Winnimuck mill, bought 1904, and enlarged to a capacity of circa 250 tons daily, latter equipped with 1 crusher, 1 Chilean mill, 3 sets of rolls, four 3-compartment jigs, 50 Wilfley tables, and 1 Wilfley slimer handling table slimes. Production, 1905, is estimated at 3,000,000 pounds. Property is supposed to have earned a fair profit, during 1905, and is considered unusually promising.

OHIO LEAD MINING & SMELTING CO.

NEVADA.

Office: care of Geo. L. Moats, general manager, Salt Lake City, Utah. Mine office: Sprucemont, Elko Co., Nev. Lands, 8 claims, area 160 acres, showing 7 fissure veins, said to give average assay values of 7% copper and 7 oz. silver per ton, also a silver-lead vein opened by a 400' shaft and tunnels of 700' and 900', with circa 3,000' of underground workings. Has a 50-ton concentrator, and smelter with 3 small water-jacket blast-furnaces, and is said to plan installing a lead stack.

OHIO-MEXICAN MINING CO.

MEXICO.

Office: 1703 First National Bank Bldg., Cincinnati, Ohio. Mine office: Caborca, Altar, Sonora, Mexico. Employs 100 men. J. H. McKibben, president; John Henderson, vice-president and general manager; W. K. McKibben, secretary and treasurer; preceding officers, O. E. Peters, B. B. Tuttle and Hon. J. A. Runyon, directors; I. R. Henderson, mine superintendent; Oscar A. Neminger, smelter superintendent. Organized August, 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par; issued, \$2,600,000.

Lands, 47 acres, also a 25-acre millsite and 6,500 acres ranch lands, in the Altar district, showing country rocks of limestone and granite, with porphyry intrusions, carrying several ore bodies, of which 3, under development, have average widths of 16', 20' and 40', opened by shafts of 400', 156', 156', 210' and 100' and by a tunnel of 380', with total openings of circa 4,000',

estimated to show 30,000 to 60,000 tons of ore, with 20,000 tons blocked out for stoping, giving average assays of 9.3% copper, 4 oz. to 10 oz. silver and \$2 to \$5 gold per ton, from carbonate ores and chalcocite. Property was opened 1857, closed 1860, on account of Indian troubles, and remained idle until taken over, 1904, by present company. Property has a 125-h. p. steam plant at the mine, and a 100-h. p. steam plant at the smelter. Equipment includes 3 hoists, good for 400' to 600' depth, and a 2-drill Rand air-compressor, with 15 shops and mine buildings, of wood, sheathed with iron. The smelter, at Calera, receiving ore by wagon from the mine, has a 60-ton water-jacket blast-furnace, turning out black copper of 90% to 95% tenor, with included gold and silver values, shipped to the Nichols Chemical Works for electrolytic refining. Company plans continuous development, on a considerable scale.

OHIO MINE.**ARIZONA.**

Office and mine: care of Louis Krockel, Metcalf, Graham Co., Ariz. A slightly developed property, of some promise, claimed to show 60' of ore, assaying up to 20% copper.

OHIO MINING & MILLING CO.**COLORADO.**

Mine office: Montezuma, Summit Co., Colo. R. T. Williams, superintendent. Ores carry gold, silver and copper. Has steam power and a small concentrator.

OJANCOS MINING CO.**CHILE.**

Out of business. Lands sold to Copiapó Mining Co., Ltd.

VERWALTUNG DER KÖNIGLICHE PREUSSISCHEN- UND**GERMANY.****HERZOGLICHE BRAUNSCHWEIGISCHE KOMMUNION****HÜTTEN-STAATSWERKE OKER.**

Is the smelting plant of the Rammelsberg mine.

O. K. EXTENSION MINING & REDUCTION CO.**UTAH.**

Office: 40 Commercial Blk., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Blue Acre, Beaver Co., Utah. A. J. McMullen, president and general manager; C. C. Gott, secretary and treasurer. Organized November, 1899, under laws of Utah, with capitalization \$150,000, shares 50c. par. Lands, 21 claims, area 360 acres, also a 20-acre millsite, near the O. K. mine, in the Beaver Lake district, showing two fissure veins of 5' average width, carrying chalcopryite assaying 4% copper and 6 oz. silver per ton, with traces of gold, opened by 6 shafts, deepest 510', and a 150' tunnel, with 1,045' of underground openings. Has steam and gasoline power.

O. K. GOLD & COPPER MINING CO.**ARIZONA.**

Office: Lyndon, Kansas. Mine office: Florence, Pinal Co., Ariz. W. L. Newcomer, president; S. B. Johnson, secretary; J. Banning, treasurer and general manager; Abe Johnson, superintendent. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 15 claims, area 300 acres, in the Picacho district, showing numerous veins, of which two, of 3' average width, are opened by 6 shallow shafts, deepest 120', and by 4 tunnels, longest 125', showing oxide, carbonate and sulphide ores, giving assays up to 20% copper, with traces of gold and silver. Idle.

OKLAHOMA MINING & SMELTING CO.**ARIZONA.**

Lands are 25 claims in the Mineral Hill district of Pinal county, Arizona. Henry G. Beard, president; Lee Troxel, superintendent. Is sinking 2 shafts, on the Jennie Captain and Malcolm claims, on a 14' vein carrying auriferous and argentiferous copper ore.

O. K. MINE.**AUSTRALIA.**

Mine office: Cloncurry, North Queensland, Australia. Allan Gibb, manager. Property shows sulphide copper ores.

OKUZU MINE.**JAPAN.**

Mine office: Okuzu-mura, Kita-Akita-gori, Ugo, Japan. Is a silver mine, near Hanawa, making a trivial amount of copper, as a by-product.

OLALLA COPPER MINING & SMELTING CO.**BRITISH COLUMBIA.**

Office: Second National Bank Bldg., Paterson, N. J. Mine office: Olalla, B. C. Robert Gaede, president; Joseph Bamford, Jr., vice-president; John E. Tylee, secretary and treasurer; A. A. Watson, general manager. Organized October, 1901, under laws of Maine, with capitalization \$8,000,000, shares \$25 par. Company controls the Similkameen & Keremos Ry. Co., capitalized at \$3,000,000. Annual meeting, second Tuesday in November. Lands, circa 50 crown-granted claims, also a 100-acre mill and smelter-site, total area circa 2,500 acres, in the lower Similkameen and Keremos camps, Osoyoos division, Yale district, showing contact veins between diorite and felsite, ore bodies occurring in both formations, but mainly in the felsite. Veins, about a dozen in number, were claimed, by a former management, to range in width from 3' to 500' and were estimated to average about 5% copper, 2 oz. to 5 oz. silver and \$1 to \$40 gold per ton, but this estimate, which was unwarranted, has been revised to reasonable dimensions by the present management, which claims to be developing a vein averaging 7' width, carrying auriferous chalcopryrite averaging 1% copper and \$4 gold per ton. Gangue is spar, garnetite and magnetite. Development includes a 70' shaft and tunnels of 200', 200', and 600'. Property has hand-power only, and is 87 miles from a railroad, 60 miles of which has steamer transportation. Company planned installation of a smelter in 1904, but did not build it. Present management is to be commended for claiming only what it can substantiate.

OLD BALDY GOLD MINING & TUNNEL CO.**NEW MEXICO.**

Mine office: Elizabethtown, Colfax Co., N. M. Thos. C. Sewall, superintendent, at last accounts. Ores carry gold and copper. Has gasoline and electric power.

OLD BALDY MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Tucson, Ariz.

OLD BOOT MINE.**ARIZONA.**

Owned by Imperial Copper Co.

OLD CATAWBA MINE.**UTAH.**

Office: care of Hon. Theo. Botkin, president and general manager, Salt Lake City, Utah. Property is a group of 7 promising claims, near Milford, Beaver county, Utah. Idle.

OLD COLONY COPPER CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Employs 12 to 15 men. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; James Chynoweth, superintendent; preceding officers, John C. Watson, Wm. Howell Reed, Rogers L. Barstow, and Stephen R. Dow, directors. Organized 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$12 paid in. Annual meeting, second Wednesday in December.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$381,350.00
Amount paid in by conveyance of property.....	700,000.00
Entire amount invested in real estate.....	764,304.26
Amount of personal estate.....	58,162.15
Amount of floating debt.....	1,955.00
Amount due company.....	72.50

Lands, 1,200 acres, in Sections 17 and 18, T. 56 N., R. 32 W., east of and adjoining the Calumet & Hecla, from which 40 acres of surface rights, in 18-56-32, were sold, 1905, to the Centennial. A complete geological cross-section was secured, by a tunnel, driven, 1899-1901, from the Eastern Sandstone, 57° west of north, for about 3,000', at right angles to the formation, which has a strike of No. 33° E., and by diamond drill borings from the Kearsarge amygdaloid eastward to the western end of the tunnel. This work shows upwards of 75 amygdaloidal and conglomerate beds, a number of which gave a little copper in the drill cores. There are 5 shafts, No. 1 being 400' deep; No. 2, 250'; No. 3, 550'; No. 4, 100'; and No. 5, 200'. In July, 1906, a little chute of copper was found, in the west crosscut on the 700' level. Results, to date, have been of a discouraging nature.

OLD DOMINION COMPANY.**ARIZONA.**

Office: 99 John St., New York. James Douglas, president, Chas. Sumner Smith, vice-president; Chas. H. Altmiller, secretary and treasurer; preceding officers, Cleveland H. Dodge, J. Waldo Smith, Maxwell Woodhull and C. G. Lund, directors. Organized Dec. 22, 1905, under laws of Maine, with capitalization \$8,750,000, shares \$25 par; issued, \$7,013,025. First dividend, of 50 cents per share, amounting to circa \$140,000, was paid December 15, 1905. Is a securities holding corporation only, organized to promote the operation of the mines of the Old Dominion Copper Mining & Smelting Co. and the United Globe Mine, under a joint management, while technically complying with injunctions restraining the merging of these two corporations. Property of the Old Dominion Co. is exclusively shares in the two subsidiary corporations named, and the Old Dominion Co. is controlled by the United Globe Mine, owned by Phelps, Dodge & Co., the United Globe having given 138,000 shares of its stock and \$250,000 cash for 138,000 shares of the Old Dominion Co. The Old Dominion Co. has exchanged its stock for shares of the Old Dominion Copper Mining & Smelting Co., and at the annual meeting, February, 1906, held 142,521

shares out of the issued capital of 150,000 shares of the Old Dominion Copper Mining & Smelting Co., and upwards of 95% of the issued stock of the Old Dominion Copper Mining & Smelting Co. is now held by the Old Dominion Co., and control of the latter is held by Phelps, Dodge & Co., through ownership of 150,000 shares of stock of the Old Dominion Co. The United Globe mine and the Old Dominion mine are operated by the Old Dominion Co., as entities, but with free interchange, upon an equitable basis, of ores for smelting and fluxing. The Old Dominion Co. financed the floating indebtedness of the Old Dominion Copper Mining & Smelting Co., by means of a loan, which has been greatly reduced, from net earnings, the balance at the close of 1905 being estimated at \$100,000, and this doubtless was paid during the first few months of 1906.

OLD DOMINION COPPER MINING & SMELTING CO. ARIZONA.

Office: 852-50 Congress St., Boston, Mass. Mine office: Globe, Gila Co., Ariz. Employs circa 1,000 men. Chas. Sumner Smith, president; preceding officer, Geo. Napier Towle and Dr. Joseph T. Herrick, executive committee; preceding officers, Chas. T. Lund, Fred. W. Hoar, E. F. Newton and G. Waldo Smith, directors; Chas. H. Altmiller, secretary and treasurer; Dr. L. D. Ricketts, consulting engineer and acting manager; Niles S. Berray, general superintendent; Chas. F. Shelby, smelter superintendent; Peter Hutton, assistant smelter superintendent. Organized July, 1895, under laws of New Jersey, with capitalization \$5,000,000, shares \$10 par: issued, \$3,750,000, Annual meeting, first Wednesday in April. The Old Dominion Company, of Maine, controls the Old Dominion Copper Mining & Smelting Co., through ownership of circa 95% of outstanding stock of latter-named corporation. Last dividend was paid 1895, but the Old Dominion Co. is a dividend payer. Had a considerable floating debt, which was taken up by the Old Dominion Co., and which had been reduced to about \$100,000, at the close of 1905, and which probably was wiped out during the first few months of 1906. A suit against Messrs. Bigelow and Lewisohn, for an accounting of promotion profits, has been decided against the company.

Lands, 6 full and 3 fractional claims, and a 10-acre millsite, at Globe, also the Old Dominion and Keystone claims, north of Globe, the Geneva mine, the Continental group of 240 acres and the Chicago & New York group of 60 acres, two latter groups being unconnected with the principal tract. The principal ore zone occurs along a displacement having a northeast and southwest strike, with sharp dip to the southeast. The hanging wall is limestone and quartzite, with a footwall of diabase of more recent age. Faulting evidently occurred both before and after the intrusion of the diabase. Ore favors the hanging wall, occurring in lenses parallel to the bedding planes of the limestone and quartzite, the largest lense yet developed being about 60x100x200' in size. The ores carried comprise a considerable variety of forms, including oxides, carbonates, sulphides and silicates. The oxidized ores are mainly cuprite, associated with a little malachite and chrysocolla, in a gangue of iron oxides and quartz. Sulphides

first appear at a depth of about 350', the principal sulphide ore being chalcocite, with gangue of iron pyrites and quartz, with a little 3% to 4% chalcopyrite in the lower workings. All ores are more or less argentiferous, and, as a rule, are highly silicious, requiring heavy iron and lime fluxes in smelting.

The Old Dominion has suffered from a lack of sulphide fluxing ore, its own supply being inadequate, and in addition to buying custom sulphide ores, from the small mines of the district, has brought in 100 tons or more daily of sulphide ores from the Bisbee field, and some concentrates from the Moctezuma mine, in the Nacozari district of Sonora, Mexico. A newly discovered sulphide ore body on the 14th level is very low in grade, averaging about 2% copper only, with a paystreak of high-grade ore. This ore is likely to improve in copper tenor at greater depth, but even should it fail to do so, is of decided value, for fluxing purposes, the rich sulphide stopes on the 11th and 12th levels being nearly exhausted. Underground developments for the two past years have been of very a favorable nature. An ore body under Pinal creek, reopened 1905, shows carbonate and oxide ores, running up to 20% copper, on the eighth, ninth and tenth levels, with chalcocite of an even better tenor on the eleventh level.

The old shafts of the mine have suffered severely from crushes and creeping, the mineralized zone being soft, hence the new shafts have been sunk in the footwall. The new main working shaft was bottomed on the twelfth level in 1905, and will be deepened. This has 4 compartments. "C" shaft was 180' deep in April, 1906, and a third, and possibly a fourth new shaft may be started, before the close of the year. The mine suffered, early in 1906, from both fire and flood, but the fire was mastered quickly, and the flow of water had diminished, by June, to circa 3,500,000 gallons daily. The mine has a pumping capacity of 6,000,000 gallons daily, the largest pumping-engine being a 1,500-gallon Prescott pump, on the tenth level, having a 12" water-column, discharging 30' above the collar of the shaft, into a launder on a trestle leading to a storage tank, whence water is drawn for use of the mill and smelter.

The engine-house and boiler-house at the new shaft are of steel frame, with iron sides and roofs. There is a large and well-equipped machine shop, which is an important factor in the success of a mine located some hundreds of miles from a large shop doing all classes of custom work. Machinery equipment includes a 30-drill Nordberg cross-compound air-compressor, with water-jacketed air-cylinders and intercooler, having a capacity of 2,000 cubic feet of free air per minute. There also is a complete electric light plant, and petroleum is used exclusively for fuel, at the power plant.

Ores are graded and furnace charges prepared at the millsite, a short distance from the mine. The grading plant has 6 steel bins, of 85 tons capacity each, for coarse ore, with a conveying belt passing beneath. Ore is drawn from the various pockets onto trammels of manganese steel, under-size dropping to an 18" conveying belt that carries it to railroad storage-bins, while the oversize goes to a 10x20" crusher and thence to a 36"

picking-belt, from which the smelting ore is hand-picked and the residue run through a 10x20' rock-breaker crushing to 2" size, the material from the last crusher being taken on an 18" belt to the concentrator storage-bins.

Mill, mine and smelter are connected by a private railway, equipped with a 14x20' Porter locomotive and 50-ton ore cars.

The 300-ton mill, of steel frame and iron-sheathed, on concrete foundations, was built from the plans of Dr. Ricketts, and went into commission July 30, 1905, and it is planned to increase the capacity to 450 tons during 1906. Equipment includes 18 Frue vanners and 9 Wilfey tables. The plant is absolutely automatic in its handling of material, and is, beyond question, one of the best mills ever built, both in theory and practice, which, in this instance, have been brought into practically perfect correlation.

The old smelting plant has been so thoroughly rebuilt and remodeled that it retains scarcely anything of the old smelter. The main buildings are of steel, on stone foundations. There are 8 double storage-bins, holding 1,000 tons of coke, limestone and ore. There are 4 blast-furnaces, each 44x180' at the tuyeres, arranged tandem, with common settlers between, charged automatically from side-dumping cars. The furnaces are rated at 400 tons daily capacity each, but are giving a duty in excess of their rating.

The converter department has three stands. Shells are 7x11', lined with a mixture of clay and quartzite, carrying 4.5% copper, the lining carrying 75% silica and making 18 tons of blister copper before burned out. Available converter blast is 18,000' per minute. Shells are handled by a 40-ton electric traveling crane. Product of the furnaces is a 50% matte, and of the converter is 99.5% blister copper, carrying small silver values. The converter slag-yard is 18x70', of concrete, with a floor of 2" iron plates, laid on brick. The dust-flue chamber is 20x20x250', connecting with a smoke-stack of 23' diameter at base and 14' at top, 200' high, on a base 25' above the tuyeres. Flue-dust is briquetted for resmelting, and a second briquetting machine, to be added, will give a daily capacity of 300 tons of fines and dust, and a reverberatory furnace may be built to smelt briquettes.

The power plant at the smelter has two 200-h. p. and two 325-h. p. boilers, burning petroleum. Blowers of 45,000 cubic feet per minute capacity furnish furnace blast, and an electric generator furnishes energy for the crane, lighting and traction, there being an electric locomotive and three 3,000-lb. tilting cars for charging, and a steam locomotive and dump-cars for handling slags. Fuel is largely petroleum, and the company still has trouble in securing an adequate coke supply for the furnaces.

The old slag-dump is estimated to carry nearly 50,000,000 lbs. fine copper, values ranging from 2% to 4% in the more modern slags, made before present management took charge, up to as high as 8% copper in the oldest slags. These slags are being resmelted, gradually, and the recovery to date has averaged about 2% copper.

It is planned to build a model hospital for employes, during 1906, and it is to be presumed that the libraries, gymnasiums and clubs found at other Phelps-Dodge mines will appear at Globe also, in time.

The Old Dominion smelter, in addition to treating Old Dominion and United Globe ores, does a large custom business, handling the ores of a half-dozen local mines, and also treating Moctezuma concentrates and more or less sulphide ore from Bisbee, latter bought for fluxing purposes. The plant is said to be treating nearly 50% custom ores. Production, which was 28,919,217 lbs. fine copper, 1905, was probably circa 16,000,000 lbs. Old Dominion copper, 7,000,000 lbs. United Globe and balance from custom ores. The smelter was producing nearly or quite 3,000,000 lbs. fine copper monthly, at the end of the year, and in May, 1906, was treating circa 40,000 tons monthly and making copper at the rate of about 3,500,000 lbs. per month. For 1904 the production of the Old Dominion mine was 15,368,147 lbs. fine copper, 86,124 oz. fine silver and 1,523, oz. fine gold. Smelter returns, 1903, were 6.54% copper and in 1904 6.41% copper, with slag loss reduced, in latter year, to only 0.48% copper. Copper cost 11.05 cents in 1903 and 11.18 cents in 1904, and should be made for 9 cents per pound, or possibly less, after improvements are completed, as all improvements, even those of a permanent nature, usually charged to "construction account" by mining companies, are charged direct to operating expenses by the Old Dominion. Profits were \$142,000 in 1904, or less than one cent per pound of product, but must have been materially larger in 1905.

The management of the Old Dominion is excellent, and while some serious problems have been presented, the greatest of these have been solved and the answers to the others will be forthcoming in time. Dr. Ricketts has done notably good work at the Old Dominion, during the two past years, seconded by the labors of an efficient staff, and backed by the experience, cash and prestige of Phelps, Dodge & Co., which is a name to conjure by, in the southwest. The future of the property appears very bright—a fitting antithesis to a stormy and not altogether happy past.

OLD GLORY COPPER CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Organized 1906, under laws of Maine, with capitalization \$1,000,000. Property is the Old Glory mine, lying west of and adjoining the Mountain Consolidated mine of the Anaconda, and between the Raven and the Snoozer claims of the Raven Copper Co., opened by a 1,200' shaft, showing ore carrying small copper values and high gold and silver values on the upper levels, with an increase in copper at depth. Property has been operated since 1885, and since 1903 has raised a little ore, from time to time, through the Buffalo shaft of the Anaconda.

OLD GOVERNORS COPPER MINING & SMELTING CO. NEW MEXICO.

Office: 215½ North Main St., Roswell, N. M. Mine office: San Marcial, Socorro Co., N. M. J. B. Rose, president; Dr. A. J. Ryan, vice-president; M. D. Burns, secretary and treasurer; H. Wallace Stevens, general manager. Organized September, 1903, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par; issued, \$670,000. Annual meeting, second Tuesday in May.

Lands, 6 claims, area 120 acres, also a 5-acre millsite, in the Dripping

Springs district, 25 miles from the Santa Fé railway, with a good wagon-road connecting, showing fissure veins in porphyry, of which one, of 18' estimated width, opened by a 30' shaft and several pits, shows malachite and sulphide ore, assaying 12% copper, 2 oz. silver and \$8 gold per ton. Company plans installing a 50-ton concentrator.

OLD HANOVER MINE.

NEW MEXICO.

Described under title Hanover Mine.

OLD HICKORY COPPER MINING CO.

NEW MEXICO.

Absorbed, circa 1901, by Copper Chief Mining Co.

OLD HICKORY MINE.

UTAH.

Owned by Majestic Copper Mining & Smelting Co

OLD NOLL MINE.

AUSTRALIA.

Mine office: Leighs Creek, South Australia. E. Bernini, manager, at last accounts. Has steam power and employs circa 20 men.

OLD PUEBLO MINING & MILLING CO.

ARIZONA.

Mine office: Tucson, Pima Co., Ariz. Alex. Rossi, president; H. Roche, vice-president; W. R. Haynes, secretary; Dr. H. E. Crepin, general manager. Lands, 9 claims, circa 5 miles west of Tucson, opened by a 70' shaft, which at a depth of 30' cut a 15-ton pocket of chalcocite, sampling 33% copper, 16 oz. silver and \$2.50 gold per ton.

OLD RELIABLE MINING CO.

NEW MEXICO.

Mine office: Golden, Santa Fé Co., N. M. J. B. Mayo, superintendent. Ores carry gold and copper. Has two 5' Huntington mills.

OLD TIEWAUKEE MINING CO.

UTAH.

Office: care of Lewis A. Jeffs, president, Salt Lake City, Utah. Capitalization \$500,000, shares \$5 par. Lands include the old Tiewaukee mine, area 120 acres, adjoining the Winnimuck, in Salt Lake county, Utah, supposed to carry the Caledonia vein at a depth of circa 600'. Deepest shaft is less than 100', development being mainly by tunnel, and the property has produced some good ore in the past. Company is said also to own the Yellow Creek property, area 90 acres, near the Hidden Fortune mine, in the Black Hills district of South Dakota.

OLD TOWN MINING & MILLING CO.

COLORADO.

Mine office: Russell Gulch, Gilpin Co., Colo. Geo. K. Kimball, Jr., superintendent. Ores carry gold, silver and copper. Main shaft, 900'. Has steam and electric power.

OLYMPIA MINING CO. OF WYOMING.

WYOMING.

Office: 187 E. Chicago Ave., Chicago, Ills. Pehr W. Nillson, president; Herman C. Johnson, secretary; John Lundgren, general manager. Lands, supposedly in the Encampment district, Carbon county, Wyoming.

OLYMPIC MINING CO.

WASHINGTON.

Office: 301 Lumber Exchange, Seattle, Wash. E. R. Butterworth, president; Alfred Jeffery, secretary. Company advertised stock on the installment plan, claiming that its lands contained gold, copper and coal, but secretary writes, as an excuse for not furnishing a statement, that the company is not developing a copper mine. Regarded with suspicion.

OMAHA COPPER MINING CO.

Office: 1017 New York Life Bldg.; Omaha, Neb.

OMAHA GOLD & COPPER MINING & SMELTING CO.**MONTANA.**

Letter returned unclaimed from former mine office, Bigtimber, Mont.

OMAKI MINE.**JAPAN.**

Mine office: Nishitate-mura, Kita-Akita-gori, Ugo, Japan. Mine was opened circa A. D. 1750, and reopened 1885. Ore bodies are lenses in Tertiary tuff and andesite. Largest lense is 70' deep and 130' long. Ore is argentite, associated with chalcopyrite, sphalerite and galena. Production, 1896, was 242,690 lbs. fine copper and 858,316 momme fine silver.

OMAR MINING CO.**ALASKA.**

Office: Canterbury Bldg., Portland, Ore. Mine office: Kiam, Alaska. Employs 50 men. Chas. E. Ladd, president; W. A. Howe, vice-president; C. E. S. Wood, secretary and treasurer; S. Peacock, general manager; H. W. Turner, superintendent; John H. Gallagher, assistant superintendent. Organized 1904, under laws of Oregon, and is operated as a close corporation. Lands, 6 claims, area 120 acres, on Prince of Wales Island, 4 miles from tidewater, at an elevation of 3,200', held on a long lease, from the Khayyam Copper Co. Country rocks are Kasaan greenstone and greenstone schists, latter in part dioritic, showing four parallel ore zones, carrying lenses in schists, these ranging 4' to 20' in width and being of unknown length and depth. Development is by tunnels of 140', 236' and 650', with 1,300' of underground openings, showing ore giving average assays of 3% copper and occasional zinc, with small gold and silver values. Ore is chiefly chalcopyrite, disseminated through pyrrhotite and marcasite. Equipment includes an aerial tram of 4,186' and a surface tram of 12,160', ending at a wharf on McKenzie Inlet. Company planned beginning shipments to Tyee smelter, early in 1906, and shipping circa 20,000 tons of ore averaging 3% copper during the year. Property considered promising.

OMODANI MINE.**JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

OMORI MINE.**JAPAN.**

Mine office: Omori-mura, Nima-gori, Iwami, Japan. Opened circa A. D. 1300; reopened 1525. Formerly was highly productive, but apparently is nearly worked out. Carries auriferous and argentiferous chalcopyrite in the Eikyu group, and malachite, argentite and native silver in the Hontani group. Production, 1900, was 2,880 momme gold, 122,280 momme silver and 80,139 lbs. fine copper.

ONECO COPPER MINING CO.**MICHIGAN.**

Office: 64-50 State St., Boston, Mass. Mine office: Boston, Houghton Co., Mich. W. F. Fitzgerald, president; S. S. Millet, secretary and treasurer; Joseph Hocking, superintendent. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Levied an assessment of 50 cents, January 15, 1906. Lands, 800 acres, known originally as the Hungarian mine, and later the Fitzgerald, on which a large amount of exploratory work was done, 1862, and again, 1899-1900. Has one shaft, of circa 500'

depth, with sundry mine buildings and 8 dwellings. Was expected to resume work, early in 1906, but did not. Fully described in Volume II.

ONEIDA GOLD & COPPER CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Nogales, Ariz.

ONOKO MINES CO.**COLORADO.**

Office: 203 Kittredge Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Samuel L. Morris, president; Edgar T. Butler, secretary and treasurer. Organized under laws of Colorado, with capitalization \$1,800,000, shares \$1 par. Lands, 5 claims, opened by a 229' vertical shaft, showing a vein with a 12" paystreak, carrying assay values up to 11.95% copper, 3.91 oz. silver and 0.17 oz. gold. Presumably idle.

ONTARIO & COLORADO GOLD**COLORADO, ONTARIO & YUKON.****& COPPER MINING CO.**

Letter returned unclaimed from former office, 610 Majestic Bldg., Detroit, Mich. Mine office: Central City, Gilpin Co., Colo. Dr. J. E. Burgess, president and general manager; Albert H. Roehm, vice-president; Wm. C. Heath, treasurer; C. H. Colburn, secretary and assistant general manager. Capitalization \$1,250,000, shares \$1 par. Has mining claims in Ontario, Colorado and Yukon, former being 65 acres adjoining the Wilcox property, on Spider Lake, Cowper township, in the Parry Sound district. Colorado property is the O'Neil mine, near Central City, carrying ores of copper, silver, gold and lead, and equipped with steam power.

ONTARIO DEVELOPMENT CO.**ONTARIO.**

Office: care of Frank Howard, Munising, Mich. M. J. Morrissey, secretary and treasurer. Organized under laws of Ontario, with capitalization \$150,000. Lands, 320 acres, 40 miles north of Sault Ste. Marie, Ontario, and just north of Goulais Bay, opened by 14 shallow pits, deepest 24', showing an 8' vein of ore, with quartz gangue, giving good assays in copper.

ONTARIO GOLD & COPPER MINING CO.**ARIZONA.**

Office: care of A. C. Burmister, manager, Prescott, Ariz.

ONTARIO MINE.**WASHINGTON.**

Mine office: Snohomish, Snohomish Co., Wash. Has a 400' tunnel, cutting a 12' vein.

ONTARIO SMELTING CO.**ONTARIO.**

Letter returned unclaimed from former mine office, Massey Station, Algoma, Ont. Lands were said to show auriferous chalcopyrite, assaying 3.5% to 6% copper.

O'OKIEP MINE.**CAPE COLONY.**

Owned by Cape Copper Co., Ltd.

OPAL GOLD MINING CO.**WASHINGTON.**

Mine office: Chesaw, Okanogan Co., Wash. J. P. Blaine, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

OPHIR CONSOLIDATED GOLD & COPPER CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Florence, Pinal Co., Ariz. Lands, 7 claims, in the Twin Buttes district, 15 miles east of Florence and circa 4 miles from the Gila river, said to show a 30' vein carrying a 4' pay-

streak showing 15% copper, with fair gold and silver values, on the McKinley claim.

OPHIR CONSOLIDATED MINES CO.

COLORADO.

Mine offices: Telluride, San Miguel Co., Colo., and Ames, San Miguel Co., Colo. W. S. Buckley, manager. Ores carry gold, silver, lead and copper, latter secured in small quantities, as a by-product. Has electric power, 50-stamp mill and 100-ton cyanide plant, employing a considerable force.

OPHIR COPPER MINING CO.

MONTANA.

Office: 404-85 Dearborn St., Chicago, Ills. Mine office: Butte, Silver Bow Co., Mont. Edw. Ryan Woodle, president; Samuel W. McMunn, vice-president; Lorene Sheetz, secretary; Matthews S. Bradley, treasurer; Sampson W. Hall, superintendent. Organized July 25, 1902, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par, in 550,000 temporary preference shares and 450,000 deferred shares; issued, \$520,000. Lands, one patented claim, area 20 acres, in South Butte, showing 3 veins, of 5', 30' and 50' average width, carrying chalcopryite and bornite, assaying 10% to 38% copper, 29 oz. silver and \$2.20 gold per ton, with molybdenite and occasional lead. Has a 256' working shaft and two 50' air-shafts, with about 5,000' of underground openings and 144,000 cubic feet of stoping, from which production, previous to 1893, was 16,700 tons of ore, of \$275,000 gross value, giving an average of \$16.45 per ton. Principal values are in silver, but copper undoubtedly will predominate at depth, indications in this mine and experience of other mines in the district supporting this hypothesis. Has a 180-h. p. steam plant, with hoist good for 1,000', a 6-drill Rand air-compressor and a 30x40' carpenter and machine shop. Idle since 1903. Property considered promising, though small.

OPHIR GOLD & COPPER MINING CO.

MONTANA.

Office: Spokane, Wash. Property is in the Blackfoot district, near Helena, Lewis & Clark county, Montana. Presumably idle.

OPHIR HILL CONSOLIDATED MINING CO.

UTAH.

Mine office: Ophir, Tooele Co., Utah. E. W. Clarke, superintendent. Ores carry gold, silver, lead, copper and zinc, with values mainly in silver and lead. Has water, steam and electric power, and a 150-ton concentrator, employing about 100 men. Is controlled by Senator W. A. Clark, of Montana, and is operated as a close corporation, no information being given out, but mine is supposedly profitable.

OPHIR MINE.

MONTANA.

Sold, March, 1906, to Butte Central Copper Mining & Smelting Co.

OPHIR MINING & DEVELOPING CO.

MONTANA.

Claimed, in advertisements, to have property in Butte, Montana. Perhaps same as Ophir Copper Mining Co.

OPHIR QUEEN MINING CO.

UTAH.

Office: Cedar River, Mich. Mine office: Ophir, Tooele Co., Utah. Samuel Crawford, secretary, treasurer and general manager. Organized April 19, 1902, under laws of Utah, with capitalization \$250,000, shares 25 cents par. Lands, 4 claims, area 53 acres, in the Ophir district, showing a 25' vein,

giving assays of 12% copper, 10% lead, 2% to 15% zinc, 16 oz. silver and 40 cents gold per ton, opened by a 335' shaft with two 5x8' compartments, and 3 tunnels, longest 220' and 225'. Has a 40-h. p. gasoline hoist, 3-drill Rand air-compressor and power drills. Presumably idle.

OPTIMO GOLD & COPPER MINING CO.**MONTANA.**

Office: Missoula, Mont. Mine office: Saltese, Missoula Co., Mont. C. J. Heidenreich, F. C. Mix and W. H. Yearick, directors. Organized, 1904, under laws of Montana, with capitalization \$1,500,000, shares \$1 par.

OQUIRRH-BINGHAM COPPER CO.**UTAH & WYOMING.**

Office: 1103-279 Dearborn St., Chicago, Ills. Mine office: Bingham Canyon, Salt Lake Co., Utah. H. A. Brown, superintendent. Organized under laws of Wyoming, with capitalization \$1,000,000. Has holdings in the West Mountain district of Utah, where some good copper carbonates were shown in the upper levels, late in 1904. Also has lands in Wyoming.

ORDENAURA MINING CO.**MEXICO.**

Mine office: Velardeña, Durango, Mex. E. K. McCann, manager, at last accounts. Ores carry copper, silver and lead.

OREGON COPPER CO.**OREGON.**

Incorporated February, 1903, by J. F. Culter, et al., of Spokane, Wash. Letter to company, care of Culter, returned unclaimed, from Spokane.

OREGON GOLD & COPPER CO.**OREGON.**

Incorporated August, 1902, by Anthony Mohr, et al., of Sumpter, Ore. Letter to company care of Mohr, returned unclaimed, from Sumpter.

OREGON HOMESTEAD MINING & REDUCTION CO.**OREGON.**

Office: care of C. J. Allen, president, Portland, Ore. Frank B. Roberts, vice-president and general manager; W. T. Perry, secretary and treasurer. Organized, 1904, to take over the Allen copper-gold mine, on Rogue river, 3½ miles south of Galice creek, Josephine county, Oregon, at a reported consideration of \$750,000. It is planned to develop power by damming Rogue river, where a considerable water power is available. Presumably idle.

OREGON ORE REDUCTION WORKS.

Dead. Organized, 1900, by Letson Balliet, to build a smelter at Portland, Ore. Promoter got into jail before smelter was built.

OREGON SHORT LINE MINING CO.**NEVADA.**

Mine office: Pioche, Lincoln Co., Nev. E. F. Freudenthal, superintendent. Ores carry copper, silver and lead. Idle at last accounts.

OREGON SMELTING & REFINING CO.**OREGON.**

Office: Postal Telegraph Bldg., New York. Works office: Sumpter, Baker Co., Ore. Employs 60 men. Walter E. Lindsay, president; G. F. Holmes, vice-president; Wm. S. Nichols, secretary; E. J. Lindsay, treasurer; Fred D. Fuller, general manager; preceding officers, Scott German and Jas. H. Caldwell, directors; Chas. Kirchen, superintendent; Chas. Van Amberg, smelter superintendent; John G. Kirchen, mining engineer. Organized March 16, 1902, under laws of Arizona with capitalization \$600,000, shares \$10 par.

Lands include a 200 acre smelter-site, 640 acres timber lands and 40 acres miscellaneous lands. Company is said to have taken a bond and lease, late in

1905, on an iron-sulphide copper mine, circa 20 miles from Weiser, Washington county, Idaho.

The smelter, at Sumpter, has a 46x88' furnace building, 46x77' boiler-house, 33x37' sampling-mill, 32x66' briquetting plant, 32x52' laboratory and 16x86' ore-bins. Smelter has a 38x148" Allis-Chalmers furnace, turning out matte averaging 40% copper, 300 oz. silver and \$150 gold per ton, sent for refining to the Tacoma Smelting Co., at Tacoma, Washington. Fuel is wood, costing \$2.50 per cord, soft coal, costing \$8 per ton, and coke, costing \$12 per ton. During 1905 the smelter treated 8,798 tons of custom ore, making therefrom 174,458 lbs. fine copper, with considerable gold and silver values.

ORE KNOB MINE.

NORTH CAROLINA.

Mine office: New River, Ashe Co., N. C. Was opened previous to 1860, and closed 1885. Is said to have yielded net profits of \$60,302, in 1874. Has a fissure vein of 6' to 20' width, with nearly vertical dip, crossing a formation of micaceous granite and mica-schist, carrying mainly sulphide ores of high average tenor, claimed to average 12% to 20% copper, opened by 11 shafts, deepest 400'. Has a 150-ton smelter, built 1902. Idle.

ORFORD COPPER CO.

NEW JERSEY.

Office: 43 Exchange Pl., New York. Works office: Constable Hook, N. J. Is controlled by the International Nickel Co. and refines nickel matte and ores from New Caledonia and nickel-copper matte from Canada, in addition to treating copper ores and mattes from the United States, Canada, Mexico and elsewhere. Capacity of plant is about 6,000,000 lbs. copper and 1,000,000 lbs. metallic nickel, monthly. Works are exceptionally well equipped, and company has a deservedly high reputation for metallurgical ability, and the fine quality of its metallic products.

ORIENTAL COPPER CO.

ARIZONA.

Office: 303 Security Bldg., St. Louis, Mo. Mine office: Cave Creek, Maricopa Co., Ariz. W. G. F. Donald, president; John B. Cabanne, vice-president; F. W. Irland, secretary and treasurer; A. S. Mills, superintendent. Organized 1904, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 11 claims and a millsite, opened mainly by tunnel, showing ore that has given assays of 8.9% copper and 6.8 oz. silver per ton, with occasional small gold values.

ORIENTAL MINING & MILLING CO.

ARIZONA.

Office: Jamestown, N. Y. Mine office: Providence, Yavapai Co., Ariz. A. F. Kent, president; W. A. Keeler, secretary; W. A. Kent, assistant treasurer; L. B. Kent, superintendent. Is primarily a gold and silver mine, carrying a small percentage of copper. Has steam power and a 20-stamp mill.

ORIENTE DE THARSIS GROUP.

SPAIN.

Letter returned unclaimed from former mine office, Alosno, Huelva, Spain. Property is large group of government concessions, including the Huera, showing extensive outcrops, remains of ancient works and some old scoria. Has about 400 metres of underground development, on a 5% ore body of 12½ metres, a 4% ore body of 7 metres and a 3.5% ore body of 5 metres, and a body of cupriferous pyrites has been cut to the northward. Deepest crosscut, about

90 metres below the crest of the hill, is on a level with the Tharsis railway and ore can be shoveled into the railroad ore-cars. Idle.

ORIENT GOLD MINING CO.

WASHINGTON.

Mine office: Bossburg, Stevens Co., Wash. Ores carry gold and copper. Has steam power. Presumably idle.

ORIGINAL CONSOLIDATED MINING CO.

MONTANA.

Office and mine: Miner Bldg., Butte, Silver Bow Co., Mont. Employs 750 men. Hon. Wm. A. Clark, president; A. H. Wethey, vice-president and general manager; W. M. Bickford, secretary; Thos. Bryant, superintendent; Jere Bourke, engineer. Organized February 20, 1904, under laws of Washington, with capitalization \$10,000,000, shares \$100 par, succeeding the Original Mining Co.

Lands include the Original, West Stewart, East Stewart, Dives, Home, Woolman and other adjoining properties, the Original and West Stewart being the principal producers. Mines are connected underground with adjoining properties and use oak guides instead of pine or other soft wood. On the 1,900' level a 17' vein with a 6' paystreak, carrying chalcocite and bornite, assaying up to 42% copper, was cut, early in 1906.

The Original mine has a 2,000' two-compartment shaft, equipped with a 126' steel gallows-frame and a 36x72" Nordberg first-motion duplex hoist, good for 3,000' depth.

The West Stewart has a 1,900' vertical shaft, to be sunk to 2,000', showing at the bottom a 30' vein said to average 10% copper, with fair silver values, the showing in the lower levels being better than above. The West Stewart has 120' steel gallows-frame, and a hoist that is a duplicate of that at the Original shaft.

The machinery equipment, in addition to the hoists, includes 4 steam air-compressors and 2 Ingersoll-Sergeant a.-compressors driven by two 200-h. p. induction motors.

The ore of the Original company is treated at the Butte Reduction Works, under the same ownership, located circa 1½ miles south of the mine, ore being transported over the line of the Butte Electric Railway Co. Production, 1905, is estimated at 18,000,000 pounds. At the beginning of 1906, the property was said to be producing at the rate of 1,200 tons of 3.5% ore daily. The company has a good management, and despite the comparatively small area of its lands, the mine is a highly productive and very valuable property.

ORIGINAL MINING CO.

MONTANA.

Succeeded, Feb. 20, 1904, by Original Consolidated Mining Co.

ORIOLE COPPER MINING CO.

WYOMING.

Office: Douglas, Wyo. Mine office: Clarence, Converse Co., Wyo. Employs 12 men. Hon. C. D. Clark, president; T. H. Howard, vice-president; E. J. Wells, secretary, treasurer and general manager; Chas. J. Wells, superintendent. Organized 1902, under laws of Wyoming, with capitalization, \$750,000, shares \$1 par. Lands, 4 claims, area 80 acres, in the War Bonnet district, carrying a fissure vein of 8' width, in granite, opened by shafts of 75' and 255',

showing carbonate ore assaying about 6% copper, with traces of gold and silver. Has a 40-h. p. steam plant, with hoist and 2-drill Leyner air-compressor. Company plans deepening shaft and crosscutting.

ORION MINING CO.

NEW MEXICO.

Office: P. O. Box 12, El Paso, Texas. Mine office: Lordsburg, Grant Co., N. M. A. W. Gifford, manager; B. W. Randall, superintendent. Organized 1898, under laws of New Mexico, with capitalization \$200,000, shares \$1 par. Property is the Dundee mine, in the Shakespeare district, Grant County, New Mexico, having about 1,000' of underground openings, said to show 10,000 tons of ore, with quartz gangue, carrying \$12 to \$14 per ton in gold, silver and copper, which must be concentrated to afford a profit. Company also owns the Three Friends, Black Hawk, and Orion Extra properties, in the Jarilla district of Otero county, New Mexico. Presumably idle.

SOCIEDAD MINERA EL ORITO.

CHILE.

Mine office: El Orito, San Felix Vallenar, Chile. Operates Las Breas mines, opened 1888, and also owns El Carmen mine, 190' deep, opened in 1857, now idle. Production, shipped as matte, is equivalent to about 1,200,000 lbs. fine copper yearly.

ORKLA GRUBE AKTIEBOLOG.

NORWAY.

Norwegian title of Orkla Mining Co., Ltd.

ORKLA MINING CO., LTD.

NORWAY.

Offices: 61, Gracechurch St., London, E. C., Eng. Mine office: Thamshavn, Norway. Thos. Fearnley, chairman; Consul Christian Thams, general manager; preceding officers, P. M. Wikstrom and Thv. Olrog, directors. Organized December 7, 1904, under laws of Norway, under title Orkla Grube Aktiebolag, with capitalization 2,000,000 kronor, shares 5,000 kronor par. Has organized a subsidiary company, for the building of a railroad of 18.5 kilometres, to transport ore from the mines to Thamshavn.

Lands, 2,500 acres, including mining, timber and miscellaneous lands, with a total of 91 claims, in the Meldal and Orkedal valleys, Southern county of Trondhjem. Principal properties are the Lokken, Hoidal and Dragset mines.

The Lokken mine, opened A. D. 1657, has a 200' upper shaft, a 900' main shaft and a 900' tunnel, showing considerable ore bodies.

The Hoidal mine, opened A. D. 1680, includes properties known as the New Hoidal and Old Hoidal, principal openings being tunnels of 200' and 500'.

The Dragset mine has shafts of 200' and 300', and a 100' tunnel.

The Aamot and Kong Karl mines have 100' tunnels each, and the Victoria mine, opened circa 1870, also has comparatively slight development. Ore in sight in the mines is estimated at 1,665,000 long tons, ore occurring in lenses of various sizes, as cupriferous pyrites and chalcopyrite, in a brecciated formation of schistose diorite, carrying iron pyrites in the foot, and chalcopyrite in the hanging.

The main dressing plant is at the Lokken mine, and aerial trams are being built from this mill to the other mines, for the transport of ore. The company has its own postoffice and telegraph office, by arrangement with the Norwegian government.

The property has a fine water-power in the Skjaenaldfos waterfall, and has erected at that point a power station, of which 110 h. p., utilized by turbine, will actuate hoists at the Lokken and Hoidal mines. A 2,400-h. p. power station at the Skjaenaldfos waterfall will furnish energy for an electric railroad line of 18.5 kilometres, running from Svorkmo to Thamshavn. This line, now under construction, will carry passengers as well as freight. A second electric railway will be built from Svorkmo to the mill at the Lokken mine, for ore transport only. Thamshavn is on tidewater, at the end of the Orkedalsfjord, which is an arm of the Trondhjemsfjord, and the company is building wharves, at Thamshavn, which will have automatic loading devices for the dispatch of ore. The railroad company will have a steamer, making 2 round trips daily, between Thamshavn and Trondhjem.

Company plans exporting annually, to Great Britain, at least 100,000 tons of pyrites and cupriferous pyrites, and hopes to increase this output materially, in time.

ORO COBRA MINING CO.

ARIZONA.

Office: 715 High St., Burlington, Iowa. Mine office: Welton, Yuma Co., Ariz. Employs 10 men. Thos. Wilkinson, president and general manager; Hon. John J. Hocking, vice-president; S. M. Wilkinson, secretary; Mark Murphy, superintendent. Organized October, 1901, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par; issued, \$900,000. Annual meeting, second Wednesday in February. Lands 10 claims, area 200 acres, in the Ellsworth district, 15 miles from the Arizona & California railroad, showing country rocks of diorite, granite, and porphyry, carrying several fissure veins in diorite and porphyry, these ranging from a few inches to 20' in width, showing oxide and carbonate surface ores giving assays of 12% to 15% copper and \$1.50 to \$80 combined gold and silver values per ton. Development is by shafts of 40', 40' and 100', and by a tunnel of 175'. Company plans continuing development work.

ORO CONSOLIDATED MINING CO.

ARIZONA.

Office: care of R. M. Reid, secretary, Colorado Springs, Colo. Mine office: Prescott, Yavapai Co., Ariz. H. I. Read, president; O. P. Hopkins, treasurer. Lands, 5 claims, patented, area 100 acres, in the Mineral Point district, 2 to 4 miles from two railroads. Ore values apparently are mainly in gold, and the company claims to have developed 7,000 tons of ore, worth \$9 to \$100 per ton.

ORO DENORO MINES, LTD.

BRITISH COLUMBIA.

Succeeded by Denoro Mines, Ltd.

ORO GRANDE MINES CO.

ARIZONA.

Letter returned unclaimed from former office, 1034 Park Row Bldg., New York. Mine office: Wickenburg, Maricopa Co., Ariz. Has upwards of 3,300' of underground openings, showing a large ore body, considerably mixed with country rock. Property is regarded as promising, but management is viewed with suspicion. Idle at last accounts.

FRANCISCO RODRIGUEZ OROZCO y CA.

MEXICO.

Office and mine: Mazapil, Zacatecas, Mexico. Mines are the Todos Santos,

La Nieva y Anexas, developed by a 175' main shaft, and a 1,000' main working tunnel. Ores carry copper, lead, silver and gold values, and property has a 75-ton smelter. Employed about 150 men, at last accounts.

ORTEGA MINING CO., S. A.

MEXICO.

Is the Mexican incorporation of Southwestern Mining Co.

ORTONA MINE.

AUSTRALIA.

Office: care of A. Linedale, owner, Irvinebank, Queensland, Australia. Mine office: Percyville, Queensland, Australia. Is slightly developed, and presumably idle.

ORVILLE GOLD & COPPER MINE CO.

BRITISH COLUMBIA.

Mine office: Golden, Kootenay district, B. C. Idle for several years.

OSAKA ELECTROLYTIC REFINING CO.

JAPAN.

Office and works: Osaka, Japan.

OSARUZAWA MINE.

JAPAN.

Owned by Mitsu Bishi Goshi-Kwaisha.

OSCEOLA CONSOLIDATED MINING CO.

MICHIGAN.

Office: 303-199 Washington St., Boston, Mass. Operating office: Houghton, Mich. Mine office: Opechee, Houghton Co., Mich. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; preceding officers, J. Henry Brooks, Edward S. Grew, Edward R. Hall and W. A. S. Chrimes, directors; Wm. J. Uren, general superintendent; Frank H. Haller, assistant superintendent; A. Lincoln Burgan, mill superintendent; H. B. Claussen, superintendent motive power; Chas. D. Hohl, chief engineer; James P. Richards, chief mining captain; Hugh James, mining captain, Osceola branch; Joseph Biscombe, mining captain, North Kearsarge branch; Frank Landers, mining captain, South Kearsarge branch; John T. Reeder, chief clerk and purchasing agent; Wm. Veale, mine clerk.

Organized 1873, and reincorporated 1903 for period of 30 years, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$2,403,750, leaving 3,850 shares unissued, in the treasury. Annual meeting, second Thursday in March. Stock is listed on the Boston Stock Exchange.

The following table gives comparative figures for calendar years 1903, 1904 and 1905:

	1903.	1904.	1905.
Tons rock stamped.....	924,400	1,095,520	1,007,200
Pounds mineral obtained. . . .	21,904,243	27,457,497	24,354,391
Pounds fine copper obtained..	16,059,633	20,472,429	18,938,965
Percentage fine copper in mineral.	73.317	74.560	76.200
Pounds fine copper per ton ton of rock.	17.4	18.7	18.8
Cost of fine copper per pound..	10.29c	9.96c	10.68c
Balance of assets.	\$131,559.63	\$505,929.40	\$867,775.47
Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:			
Amount of cash paid in on capital stock	\$ 890,628.78		

Amount paid in by conveyance of property	1,609,371.22
Entire amount invested in real estate	1,299,621.47
Amount of personal estate	1,530,505.37
Amount of floating debt	1,024,575.97

Real estate includes 2,120 acres, in 4 separate tracts, also an extensive millsite, in Houghton county, and sundry timber and miscellaneous lands, in Houghton and Keweenaw counties, Michigan. Mines owned are the Osceola, North Kearsarge, South Kearsarge and Tamarack Junior, the latter idle, and the others active producers.

The old Osceola mine was opened in 1873, on the southern extension of the Calumet conglomerate, six shallow shafts being sunk thereon, but this bed proving unremunerative, except under a few acres, it was abandoned, and work was begun on the Osceola amygdaloid, lying parallel with and 730' east of the Calumet conglomerate. The Osceola mine proper, area 720 acres, lying next south of the Calumet & Hecla, has 6 shafts on the Osceola bed, which has a strike of approximately N. 39° E., shafts being numbered from north to south. Shafts 1 and 2 are permanently abandoned. No. 3, with 3 compartments, circa 3,000' deep, is idle. No. 4 is 600' next south, with 3 compartments and about 3,700' deep, and is idle. There is small likelihood of shafts 3 and 4 being reopened, the ground tributary to them being nearly exhausted, while the good stopes remaining can be reached from No. 5. No. 5, 1,300' south of No. 3, is 3,900' deep, cut down and retimbered throughout, in 1903. No. 6, or Opechee shaft, 1,300' next south, 4,100' deep, shows some excellent stopes especially in the southern drifts, at the bottom. There is room on the company's tract for one more shaft, south of No. 6, if desired. Shafts 5 and 6 have practically duplicate surface equipments, with Nordberg hoists good for 6,500' depth. About 60% of the production of the old Osceola is secured from No. 6, and 25 power drills are worked in the two shafts. Crosscuts have been sent to the Calumet conglomerate at various depths, without encouragement, and diamond drilling was done in 1904, to locate and test the Kearsarge amygdaloid, on the Osceola tract, but the results presumably were not of an especially encouraging nature. The mine has a complete power equipment, with shops, mostly of stone, and a large number of dwellings for workmen. Water is pumped from Lake Superior, for use of the mine and employees.

The Tamarack Junior mine, area 120 acres, lying between the Centennial and Calumet & Hecla, has two vertical shafts, on the Calumet conglomerate, No. 2 being 3,360' deep, with 12 levels opened. Mining was stopped in 1902, and exploratory work was suspended at the end of 1903. Apparently the Tamarack Junior is dead for all time to come, so far, at least, as the conglomerate openings are concerned, with rather poor prospects of finding any other workable cupriferous bed on the tract.

The North Kearsarge mine, area 1,120 acres, lies north of the Wolverine, with which it has underground connections, and with which land has been exchanged to the extent of 13½ acres, this trade permitting each mine to square its boundaries with the strike of the lode. Shafts are numbered from south to north. No. 1 shaft, 4,000' deep, has a Nordberg hoist good for 6,500'

depth, operating two 6-ton skips in counterbalance. No. 2 shaft, abandoned, is 2,400' deep. No. 3 shaft, lying 1,825' northeast of No. 1, is 2,769' deep, developing a large area of good ground, the north drifts showing best, while the Ahmeek developments point to rich ground for the North Kearsarge toward its northern boundary line. There is room at the north for an additional shaft, beyond No. 3. The Kearsarge amygdaloid bed ranges 16' to 20' in width in this mine, and has proven very bunchy, the mine having been a disappointment during 1904 and 1905, but showing more encouragement in the early months of 1906. The south levels, approaching the Wolverine boundary, are showing an improvement, and the lower levels to the north are showing a gain over the poor rock above. Concrete probably will be substituted for wood, in shaft timbering.

At No. 1 shaft there is a stone compressor-house and 30-drill compressor. The office building, combination machine and carpenter shop and warehouse, all of wood, are at this shaft. At No. 3 is located a 45-drill compressor, with two-stage air-end and compound steam-end, having 22x48" and 42x48" steam cylinders and 40x48" and 36x48" water-jacket air-cylinders and vertical inter-cooler, housed in a 25x55' stone and brick building, with steel truss roof.

Extensive diamond drilling was done at the North Kearsarge, during 1905, with excellent results, considerable good stamp-rock having been developed in the foot and hanging walls, at points where the main lode was impoverished. Diamond drill boring costs \$2 to \$3 per foot, as against \$6 to \$8 per foot for drifting.

The South Kearsarge mine, area 160 acres, lies south of the Wolverine and east of the Centennial. Development was begun September, 1899, and the best stopes are toward the Centennial line, the lode showing about the same width as in the North Kearsarge and Wolverine mines. There are two shafts, 1,100' apart, ample for all future requirements. No. 1, the northern shaft, is 1,850' deep, and can be sunk about 3,000' before reaching the boundary line. Two skips are operated in counterbalance, and the rock-shafthouse is exceptionally large and well equipped, as it also cares for the rock from No. 2 shaft, with which it is connected by a 1,100' trestle. No. 2 shaft, 1,762' deep, can be sunk to a depth of circa 2,800' before reaching the boundary line. The surface equipment of the South Kearsarge is mainly second-hand, but efficient, and ample for all present requirements, including the old hoist from No. 2 North Kearsarge, raising 5-ton skips. The mine has air-compressors of 55 drills aggregate capacity.

New openings, 1905, in the various branches, were 25,845', and have averaged circa 5 miles yearly, since 1901, the cost of all openings being charged direct to operating expenses, which is the plan that should be followed by all producing mines. There is comparatively little rock selection, the amount rejected having been about 9% in 1904 and 12% in 1905. It is proposed to change the mining policy so that waste rock will not be hoisted, the culls remaining underground and being used for filling, as at the Baltic mine. The matter of power haulage is being given consideration also.

The Osceola has two stamp-mills, on the shore of Torch Lake, adjoining those of the Tamarack. The old wooden mill, built 1886, was torn down in 1905, its equipment being hopelessly antiquated. The second mill, completed 1899, is 135x215', and had three stamps with 20" pistons and 24" stroke, supplied with circular shoes and striking 100 blows per minute, at 95 lbs. steam pressure, which stamped above 550 tons each, in a day, on test runs. The screens are circular, with $\frac{1}{2}$ " openings, allowing easy discharge of coarse copper. The third mill, completed 1902, standing in line with the other, is of steel, 176x213', and had 4 Nordberg heads of the 4-valve type, with 20x24" cylinders and circular mortars having $\frac{1}{2}$ " screens and hydraulic separators. About 20% of the copper secured in milling comes from the separators and the mortar discharges. The compounding of a stamp, by superimposing the low-pressure cylinder above the high-pressure cylinder, was first suggested by Mr. A. L. Burgan, mill superintendent of the Osceola, and the idea was carried into execution by Mr. B. V. Nordberg. The experimental head compounded in this manner, known as the steeple-compound, gave such satisfactory results that all 8 heads in the two Osceola mills have been compounded. In these heads the low-pressure cylinder gives power on the down-strokes only, while the superimposed high-pressure cylinder is double-acting and raises the piston, as well as aiding in forcing it down.

The compounding of the heads necessitated a considerable increase in wash-room at the mills, the compounded heads treating circa 30% more rock than before, as single-stage stamps. The equipment in the wash department includes 110 Hodge jigs, having quick eccentric return motion, with 6 round tables and one Wilfley table for each stamp, the latter taking headings from the round tables, also an Allis-Chalmers Chilean mill for regrinding. For reducing oversize material from the mortars of the stamps, crushing rolls with fixed bearings were introduced, this also being an idea original with Mr. Burgan, and which is working well in practice. Boilers now work under a pressure of 150 lbs. per square inch and as a consequence of the various improvements adopted, the cost of stamping at the Osceola mills, for 1905, was only 16.95 cents per ton of 2,000 pounds—so far as known, the cheapest milling cost ever secured at any mine crushing rock.

The 43x150' steel boiler-house, adjoining the mills and furnishing power for both, has three 72" 250-h. p. boilers delivering steam at 150 lbs. pressure, and nine 84" 250-h. p. boilers operated under 105 lbs. pressure, all of the locomotive firebox type. Coal is brought to a 500-ton bin over a trestle, in railroad cars. An automatic ash-discharge washes ashes through a launder by water flushed from a stand-pipe at intervals of 3 minutes. Draft is furnished by a 150' brick-lined self-supporting steel stack. An Allis-Chalmers Corliss engine runs a 100-kw. Morgan-Gardner direct-current generator, operating incandescent and enclosed arc lamps at 220 volts.

The joint pump-house of the Osceola and Tamarack mines, of steel, 35x70' in size, houses two 40,000,000-gallon triple-expansion Nordberg pumps having 22", 40" and 60" cylinders, with three 30" horizontal plungers of 52" stroke and 42" discharge. Water is secured through an 8' tunnel, running 1,275' under Torch

Lake, drawing water through 3" intake holes, these guarding against clogging by ice. Rock is hauled from mine to mill by the Hancock & Calumet railroad.

Production of fine copper was 20,472,429 lbs. in 1904 and 18,938,965 lbs. in 1905, the decrease being caused by a combination of fortuitous circumstances, including a serious dynamite explosion in the North Kearsarge, strikes, and a lessened percentage of copper in the North Kearsarge rock. For 1906 a larger production should be secured. Dividends, suspended during 1902-1903, were \$2 in 1904, and \$6 in 1905, while the first semi-annual dividend of 1906, paid July 27, was \$6, foreshadowing \$12 profit disbursements for the year. The Osceola Consolidated is a large and valuable property, and while results in the past have not been secured as quickly as hoped by shareholders, the profits now being earned are much the largest in the history of the company, and with the anticipated betterment in the North Kearsarge, the efficient work now in progress will yield a full measure of financial reward.

OSCEOLA GOLD & COPPER MINING CO.

WYOMING.

Property sold, circa 1902, to North American Copper Co.

OSCEOLA JUNIOR MINING CO.

WYOMING.

Office: Rawlins, Wyo. Mine office: Dillon, Carbon Co., Wyo. J. M. Rumsey, secretary; A. L. Clendennin, superintendent. Lands, near the Ferris-Haggarty mine, have an old 120' tunnel, and work was resumed, and a new tunnel started, February, 1906.

OSCURO COPPER CO.

Office: care of H. A. Rideout, Wollaston, Mass. Organized March, 1903, with capitalization \$250,000.

OSE MINE.

JAPAN.

Mine office: Ose-mura, Kita-gori, Iyo, Japan. Ore occurs in lenses, largest 230' long, 100' wide and 43' deep, carrying chalcopyrite averaging 3% to 4% copper. Production, 1900, was 9,426 lbs. fine copper.

OSHKOSH-WYOMING MINING CO.

WYOMING.

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. O. A. Koch, president; E. E. Mullins, vice-president; H. O. Granberg, secretary, treasurer and general manager; Frank Earle, consulting engineer. Organized June 20, 1904, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued, \$215,000. Lands, 11 claims, area 225 acres, in the Battle Lake district, showing country rocks of quartzite and gabbro, carrying 4 fissure veins in gabbro, of 22' estimated average width, opened by shafts of 32' and 72' and a 22' tunnel, showing malachite, azurite and chalcopyrite, estimate to carry average values of 18% copper.

LOS OSOS MINE.

CALIFORNIA.

Office: care of J. M. Gleaves Estate, owner, San Francisco, Cal. Mine, near San Luis Obispo, San Luis Obispo county, California, is opened on a fissure vein, carrying copper ore with porphyritic gangue, traversing sandstone and shales. Idle since circa 1865.

OTAVI MINES & RAILWAY CO.

GERMAN SOUTHWEST AFRICA.

English title of Otavi Minen- und Eisenbahn-Gesellschaft.

**OTAVI MINEN- UND EISENBAHN- GERMAN SOUTHWEST AFRICA.
GESELLSCHAFT.**

Offices: 14, Behrenstrasse, Berlin, W. Germany. Mine office: Swakopmund, German Southwest Africa. A. Schoeller, chairman; Dr. P. D. Fisher, vice-chairman; A. Gaedertz, general manager; F. Müller von der Werra and Dr. P. Gloner, assistant general managers; Dr. P. Schwabach, general counsel; Th. Gathmann, mine superintendent; Tob. Toennesen, engineer in charge of railway. Organized 1900, under laws of Germany, with capitalization 20,000,000 marks, shares 100 marks par, in 20 series of 10,000 shares each.

Lands, 500 square miles, freehold, including the Otavi and Tsameb copper mines, in Ovamboland. Latter has been developed largely and can begin production upon a considerable scale, when given rail facilities and a smelter. A railroad line of 570 kilometres is now being built from Alexandre, Portuguese Southwest Africa, to the mines, by the firm of Arthur Köppel, at an approximate cost of \$4,500,000, and should be completed before the end of 1907. The mines are decidedly promising, and the company is financially strong, and managed by experienced men.

OTTUMWA COPPER CO.**WYOMING.**

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. C. B. Richey, president; W. B. Russey, secretary and treasurer. Lands are the Ottumwa group of claims, about 6 miles southeast of the Rambler mine and 9 miles from Holmes. Development is by a 280' tunnel, not yet to the vein, which carries ore of concentrating grade.

OUED-MOUGRAS COPPER & IRON CO., LTD.**ALGERIA.**

Offices: 135, Wellington St., Glasgow, Scotland. J. A. French, secretary. Organized Oct. 9, 1903, with capitalization £12,500, shares £1 par; issued, £4,811. Organized to carry on mining in Algeria, or elsewhere.

COMPAÑIA MINERA LAS OURAS.**MEXICO.**

Mine office: Tepezalá, Aguascalientes, Mex. Gabriel Chaves, superintendent. Has copper and silver ores.

OURAY CHIEF MINING CO.**COLORADO.**

Office: Youngstown, Ohio. Mine office: Ouray, Ouray Co., Colo. W. D. Euwer, president; John Beil, secretary; David Ward, superintendent. Ores carry gold, silver and copper. Has gasoline power.

SUCESIÓN RAMÓN F. OVALLE.**CHILE.**

Mine office: Carrizal Alto, Freirina, Atacama, Chile. Operates the Canto del Agua mine, opened 1870, also the Santa Margarita mine, 700' deep, and about a dozen smaller properties. Production, in form of matte when exported, averages circa 1,250,000 lbs. fine copper yearly.

OVERFLOW MINES (NO LIABILITY.)**AUSTRALIA.**

Offices: 18, Bridge St., Sydney, N. S. W., Australia. Mine office: Bobadah, N. S. W., Australia. T. H. Palmer, manager. Ores carry gold, silver, lead and copper. Has a Ball mill, 40-ton cyanide plant and 50-ton smelter. Employed about 150 men, at last accounts.

OVERLAND GOLD MINING CO.**OREGON.**

Mine office: Cableville, Baker Co., Ore. Ores carry gold, silver, copper, lead and zinc.

OVERSIGHT MINING & MILLING CO.**WASHINGTON.**

Office: Seattle, Wash. Mine office: Republic, Ferry Co., Wash. E. J. Delbridge, manager. Capitalization \$1,500,000, planned to be increased to \$2,500,000, shares \$1 par. Lands, 10 claims, in the Lambert Creek or Eureka district, circa 10 miles north east of Republic, and north and west of the Turtle river, opened by a 23' shaft, showing hematite and pyrite, and a 250' tunnel said, early in 1906, to have cut a 40' vein of low-grade copper ore, carrying gold and silver values.

OVOCA COPPER SYNDICATE, LTD.**IRELAND.**

Offices: 19, Queen Victoria St., London, E. C., Eng. Mine office: Ovoca, County Wicklow, Ireland. E. H. Davies, chairman; St. John Winne, secretary. Organized Nov. 27, 1901, with capitalization £12,000, shares £1 par. Property is the old Cronnebane mines, in the Vale of Ovoca, which were making about 1,250,000 lbs. of refined copper annually, at the end of the Eighteenth Century. Mines were closed, circa 1875, and reopened, 1902, on the advice of Mr. Philip Argall. High-grade oxide and carbonate ores were mined out in past operations, but the vein, about 50' in average width, shows immense bodies of low-grade disseminated chalcopyrite, with quartz gangue, averaging a scant 3% copper, 1.5% zinc, 1.5 oz. silver and 1 dwt., 6 grains gold, per long ton. A new shaft is being sunk, and a little ore is shipped, as raised, from development work only. Results to date are considered promising.

JOHN OWEN MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. Riley, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employed about 25 men, at last accounts.

OWL HEAD MINING CO.**ARIZONA.**

Office and mine: care of Ferris S. Fitch, Tucson, Pima Co., Ariz. Organized 1904, to take over sundry claims in the Owl Head Mountains, 32 miles from Tucson, carrying auriferous and argentiferous copper ores. Also owns claims 10 miles west of Tucson. Presumably idle.

OWOSSO GOLD & COPPER MINING CO.**WASHINGTON.**

Moribund.

OXFJORDALEN COPPER CO., LTD.**NORWAY.**

Offices: 23, Leadenhall St., London, E. C., Eng. G. B. Mee, chairman; W. A. Stearns, secretary. Organized Oct. 28, 1901, with capitalization £10,000, shares £1 par; debentures, £5,000 authorized, £310 issued, at 5%. Property is 32 claims, at Oxfjordalen, Norway, held on option, upon which some development work has been done, 1903-1905.

OXIDE COPPER CO.**ARIZONA.**

Office: 85 Ames Bldg., Boston, Mass. Mine office: Red Rock, Pinal

Co., Ariz. Frank Higgins, superintendent. Stock is owned by Arimex Consolidated Copper Co. Lands, are the Copper Prince group, 30 claims, in the Silver Bell district, south of the Imperial mine and 7 miles from the showing contact veins with lime gangue. Copper sulphides are shown at new Arizona Southern railway. Country rocks are limestone and quartzite depths of 50' to 150'.

PACIFIC COAST COPPER CO.

ALASKA.

Reorganized as Pacific Coast Mining, Milling & Developing Co.

PACIFIC COAST MINING, MILLING & DEVELOPING CO.

ALASKA.

Mine office: Ketchikan, Alaska. Is a reorganization of the Pacific Coast Copper Co. Has a lease of promising copper claims, on Prince of Wales Island, Alaska, but is in bad shape financially, and idle.

PACIFIC COAST ORE SAMPLING WORKS.

CALIFORNIA.

Letter returned unclaimed from former office and works, Oakland, Cal.

PACIFIC COAST SMELTING & REFINING WORKS.

CALIFORNIA.

Office and works: Bay Point, Contra Costa Co., Cal. Was built by the Copper King, Ltd., of unfortunate memory. Plant includes a 100-ton furnace, with steam and electric power.

PACIFIC CONSOLIDATED MINING CO.

NEVADA.

Office: 131-32 Broadway, New York. Mine office: Reno, Washoe Co., Nev. Employs circa 25 men. Chas. B. Hill, president; Franklin Leonard, vice-president; Wm. Hazen Peck, secretary; H. L. Cowles, treasurer and general manager; preceding officers, F. P. Knott, J. A. Alexander, and Frank N. Waterman, directors; Robert W. Perry, superintendent; Dr. Jos. Hyde Pratt, consulting engineer. Organized 1901, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par; issued, \$2,500,000, of which \$1,000,000 is common and \$2,000,000 is 6% cumulative preferred stock, latter having preference as to assets, and practically being a first lien.

Lands, 32 claims, also a 50-acre millsite, area circa 650 acres, in the Pyramid district, showing 4 parallel ledges, of which 2, under development, are estimated to have average widths of 30' to 60', giving assays of 2% to 40% copper, 6 oz. to 100 oz. silver and \$1.50 gold per ton. The oxidized zone, extending to depths of 200' to 350', gives good gold and silver values, succeeded by base ores giving small gold values and fair silver values. Principal ore is chalcopyrite, associated with iron pyrites, in a silicious gangue. Mine has circa 30 shafts, of 30' to 75' depth, and a main shaft of 522', also tunnels of 250', 1,000' and 2,400', with about 19,000' of underground workings, estimated to show 500,000 tons of ore. Property was discovered and opened, circa 1876, for gold and silver, ore turning to copper at depth. Surface improvements include a smithy, carpenter shop and various other mine buildings.

Nearest railroad is the Southern Pacific, 28 miles distant, but company has a franchise for a standard-gauge railroad from the mines to a point on the Southern Pacific railway, 12 miles east of Reno. Company plans continu-

ing development work and preparing the property for a daily production of 500 tons of ore. The cost of the railroad is estimated at \$300,000, including a light equipment, and the company reports that financial arrangements for building the line were practically completed, early in 1906. The property has been favorably reported upon by Dr. Pratt, an authority of deservedly high standing, and the management of the mine seems conservative and businesslike.

PACIFIC CONSOLIDATED MINING & SMELTING CO.

UTAH.

Office: care of Willard F. Snyder, president, Salt Lake City, Utah. C. O. Ellingwood, secretary and treasurer. Organized October, 1902, with capitalization \$1,500,000, shares \$5 par, to develop the Amy and Baltimore groups of 29 claims, in the Merrimac district of Utah. Presumably idle.

PACIFIC COPPER CO.

MICHIGAN.

Office: 303-199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Albert S. Bigelow, president; Arthur G. Stanwood, treasurer. Organized August, 1890, under laws of Michigan, with capitalization \$1,000,000, shares \$25 par; paid in, \$2. Ended 1905 with cash on hand, \$922.55. Lands, 960 acres, just northwest of the Atlantic mine, supposed to carry the northern extension of the Atlantic ashbed, on which a little work was done, previous to organization of the company in 1890, since which time the property has been idle.

PACIFIC GOLD & COPPER CO.

No definite information obtainable. President's office said to be "in the saddle," hence it is to be presumed that the secretary's office is "under his hat."

PACIFIC GOLD & COPPER MINING CO.

MEXICO.

Office: 308 East Ninth St., Kansas City, Mo. J. J. Myers, president; D. C. Rhodes, secretary. Organized under laws of South Dakota, to develop extensive mineral holdings in the Taviche district of Oaxaca, Mexico.

PACIFIC MINING & DEVELOPMENT CO.

OREGON.

Dead. Lands sold

PACIFIC MINING & METALS CO.

ARIZONA.

Office: 213 Kittredge Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz. John Russell, president; F. A. Hunt, secretary; John D. Coplen, treasurer and general manager. Organized January 7, 1903, under laws of Arizona, with capitalization \$10,000,000, shares \$1 par. Lands, 30 claims, in two groups, with miscellaneous holdings giving a total area of 760 acres. The north group is on Pinto Creek, 20 miles west of Globe, Gila county, and the south group in the Cañada del Oro district of Pinal county, former group showing country rocks of schists and porphyry, and south group showing granite-porphyry country rock. South group is said to average 5% copper from carbonate, oxide and sulphide ores. The north group has 3,309' of underground openings, and the south group 550', claimed by company to show 2,000,000 tons of ore. The Globe property is regarded as one of considerable promise. Presumably idle.

PACIFIC SMELTING CO., LTD.**CHILE.**

Office: 32, Great George St., Westminster, London, S. W., Eng. Mine office: Taltal, Antofagasta, Atacama, Chile. Employs 160 men. Geo. A. Watson, chairman; preceding officer, F. S. Bishop, J. H. Collins, H. F. Collins and H. Fisher, directors; J. H. Melrose, secretary; Alfred Radcliffe, general manager; Samuel Jenkin, mine captain. Organized July 29, 1902, as successor of the Smelting Corporation, Ltd., with capitalization £100,000, shares £1 par; issued, £25,107. Debentures, £240,000 authorized and £3,000 issued, at 5%, which were retired, 1905.

Lands, sundry mining claims, in the Canchas district, 30 miles from Taltal, carrying a fissure vein of circa 40" width, showing carbonate copper ores, with ferruginous gangue. Mining operations are as yet in an initial stage. The smelter, at Taltal, was blown in March, 1904, but as yet treats custom ores only. Smelter is served by the Taltal railway, a spur of which enters the works, while the main line is not far distant from the mine. Smelter has revolving calciners, 3 reverberatory furnaces and an 80-ton blast-furnace. Monthly production is circa 250 tons of matte, of about 55% copper tenor, and output of fine copper for 1905 is estimated at 3,700,000 pounds.

PACIFIC STEEL CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Alberni, Vancouver Isld., B. C.

PAGOEAT COPPER CO.**CELEBES.**

Holds sundry copper claims in the Pagoeat district, on the northern part of the island of Celebes, Dutch East Indies. Company is composed of men connected with a prominent steamship line of Amsterdam, Holland. Lands show numerous veins, ranging 4' to 5' in width, carrying carbonate ores, chalcocite and chalcopyrite, in quartz gangue, of average assay tenor of about 10% copper, with small gold and silver values. Management is composed of excellent people, who lack mining experience. Was developing, at last accounts.

PAHAQUARRY COPPER CO.**NEW JERSEY.**

Office: Bangor, Pa. Lands are mineral rights to 1,028 acres, in Paha-quarry township, Warren county, New Jersey, formerly worked as a copper mine, showing low-grade ores in the old workings. Company was said, March, 1906, to have placed an order with the Colorado Iron Works Co. for milling machinery, including 2 sets of 16x30" Standard rolls, 4 sets of 10x30" Standard rolls, and 22 impact screens. Is said to have a 200-ton concentrator, but probably mill is of smaller capacity.

PALACE GOLD & COPPER CO.**ARIZONA.**

Office: 1104 D. S. Morgan Bldg., Buffalo, N. Y. Mine office: Wickenburg, Maricopa Co., Ariz. Geo. A. Sanborn, president; C. M. Clark, vice-president and general manager; M. W. Fuller, secretary; Dr. C. H. W. Auel, treasurer; D. Ainsworth, engineer. Organized Nov. 10, 1902, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 23 claims, in three groups. The Union mine, apparently one claim only, in the Winifred district, has a 400' main shaft, with about 2,200' of underground open-

ings, claimed to show good values in gold, silver and copper. The Ainsworth group, 8 miles southeast of Wickenburg, has 4 prospect shafts, deepest 40'. The third group, known as the Tip Top, is in the Bradshaw Mountains.

The methods of promotion followed in placing the stock of this company are self-condemnatory, and would damn any set of directors, no matter whom they might be. Stock, all common, is sold at three prices, viz., 25 cents, 50 cents, and one dollar per share. The man who buys for 25 cents gets just shares, the man who buys for 50 cents gets a partial guarantee, and the man who buys for a dollar gets a guarantee of $3\frac{1}{2}\%$ annually, for 20 years, which is 70 cents on the dollar, leaving him out the use of 75 cents for an average term of ten years, and paying 5 cents per share more than his neighbor, at the outset. Any "guaranteed" mining stock is a delusion and a snare. Either the guarantee is worthless, or the "sucker" who buys it pays cash in advance, not only for every cent guaranteed him, but also for the cost of guaranty, cost of promotion and the salary and expenses of whoever may be working the game.

PALM DEVELOPMENT CO.

CALIFORNIA.

Office: care of E. M. Ross, Los Angeles, Cal. Lands, 23 miles northeast of Acton, Los Angeles county, California, show auriferous and argentiferous malachite, occurring as replacements in a porphyritic dike averaging 180' width, traceable $1\frac{1}{2}$ miles. Has three shafts, deepest 125'. Had a leaching plant, but water supply gave out. Idle for several years.

PALMER MOUNTAIN COPPER

WASHINGTON.

MINING & MILLING CO.

Office; Spokane, Wash. Mine office: Loomis, Okanogan Co., Wash. Organized under laws of Washington, with capitalization \$1,500,000. Lands, sundry claims, on Palmer Mountain.

PALOMA MINING CO.

MEXICO.

Letter returned unclaimed from former office, Springfield, Ills. Mine office: Ayutla, Jalisco, Mexico. Lands include La Puerta, La Falda, La Chapuza and La Providencia mines, in the vicinity of San Antonio de Las Morán. Mine is said to have a 25-ton experimental mill.

PAN-AMERICAN EXPLORATION CO.

MEXICO.

Succeeded by Cacoma Mines & Smelter Co.

PAN-AMERICAN MINES CO.

MEXICO.

Presumably dead. Letters returned from former office and mine office.

PAN-AMERICAN MINING & SMELTING CO.

ARIZONA & MEXICO.

Office: 905-11 Broadway, New York. Mine offices: Prescott, Yavapai Co., Ariz., and Maguarachic, Chihuahua, Mexico. A. Howard Skinner, president; Harry F. Lindsley, secretary and treasurer; Bowling Green Trust Co., New York, registrar. Organized under laws of Arizona, with capitalization \$15,000,000, shares \$5 par, in \$3,000,000 preferred 7% stock and \$12,000,000 common stock.

This company was promoted by the notorious Dr. R. C. Flower, who was successful in swindling many unsuspecting American investors, and who, at last accounts, was supposed to be traveling in Mexico, in various

disguises, and hitting the high spots only. The company was also assisted in securing the Quebradillas mine, of Parral, by Grant G. Gillett, the cattle plunger, who left Kansas City between two suns, leaving also a large number of creditors. That preeminent firm of mining swindlers, L. E. Pike & Co., of 294 Washington St., Boston, Mass., also aided in the promotion. The company succeeded the Lone Pine Mining Co., alias the Arizona, Eastern & Montana Smelting & Ore Purchasing Co., of most unsavory memory, succeeding the Buenos Aires Mining Co., Urique Gold Mining Co., Sunset Mining Co. and La Paz Mining Co., which may or may not have had ore of payable grade. Several mines were abandoned, without taking final titles. The Quebradillas mine, of Parral, was optioned by Gillett, but the bond was allowed to lapse. The various Mexican holdings of the Pan-American company, some of which may or may not still be held, included the Recompensa group, at Maguarachic, the Hernandez group, at Miñaca, and La Liga and Santa Camilla mines, at Concepción, all of Chihuahua, Mexico, also the Ambidexter group, in Arizona, located circa 1900, on which no ore was found.

PANTEIDAL COPPER CO., LTD.

WALES.

Offices: 21, Lawrence Lane, London, E. C., Eng. G. Thompson, secretary. Organized Nov. 15, 1898, with capitalization £25,000, shares £1 par: issued, £16,007. Property is mineral rights to two farms, in Merionethshire, Wales. Inactive for some years.

PANUCO COPPER CO., LTD.

MEXICO.

Lands sold, circa 1905, to Continental Copper Co. Described in Vol. V.

PANULCILLO COPPER CO.

CHILE.

Succeeded, 1898, by Central Chili Copper Co., Ltd.

PAPAGO MINING CO.

ARIZONA.

Letter returned unclaimed from former mine office, Aztec, Arizona.

PAPOVSKI MINE.

SIBERIA.

Office and mine: Semipalatinsk, Siberia. Owned and operated by Papov's Successors. Production, 1899, was 129,497 lbs. fine copper.

PARADISE DEVELOPMENT CO.

ARIZONA.

Office: care of F. B. Dorr, secretary, and treasurer Douglas, Ariz. Mine office. Paradise, Cochise Co., Ariz. E. C. Huxtable, president; J. L. Andrews, vice-president; S. S. Badger, consulting engineer; preceding officers and R. A. Hall, directors. Lands, known as the Morning Star group, lying west of the Cochise Consolidated Copper Co., in the Chiracahua Mountain, have a 90' tunnel, showing a little carbonate and sulphide ores, giving assays as high as \$40 per ton, in combined copper, silver and gold values.

PARADOX COPPER-GOLD MINING CO.

COLORADO.

Absorbed, 1903, by San Juan Smelting & Refining Co.

PARADOX MINING & MILLING CO.

Office: Grand Junction, Colo. Mine office: Paradox, Montrose Co., Colo. Employs 6 men. J. A. McCulloch, president; T. W. James, vice-president; A. A. Miller, secretary and general manager; D. T. Stone, treasurer. Organized January 25, 1905, under laws of Colorado, with capital-

ization \$1,500,000, shares \$1 par; issued, \$877,300. Lands, 12 claims, area circa 110 acres, also a 5-acre millsite, in the La Sal and Paradox districts, showing country rocks of limestone, sandstone, shales and quartzite, with intrusive porphyry, carrying 3 fissure and contact veins of 2' to 7' width, opened by tunnels of 85', 100', 200' and 400', showing melaconite and argentite, giving assay values of 3% to 75% copper, and 1 oz. to 1,000 oz. silver per ton, with a trace of gold. Property is 65 miles from a railroad, and is reached by a good wagon-road. Company plans continuing development.

PARAMATTA COPPER MINES, LTD. **AUSTRALIA.**

Offices: 22, Chancery Lane, London, E. C., Eng., and 29, bis, Rue Nationale, Lille, France. Mine offices: Wallaroo, Daly Co., and North Yelta, Daly Co., South Australia. E. Dervaux, chairman; L. G. Hancock, mine manager; H. Duquesne, secretary. Organized May 18, 1899, with capitalization £200,000, shares £1 par; issued, £198,500. Debentures, £20,000 authorized, £9,300 issued, at 5%. Lands, 1,340 acres, held on 99-year lease, at annual rental of \$1 per acre, plus 2½% net profits. Property includes the Paramatta, Yelta, Wheal Hughes, and Wheal James mines. The Paramatta, adjoining the Wallaroo mines of the Wallaroo & Moonta, is an old and important producer, reopened, 1900, by present owners. Deepest shaft is 500', bottomed in a vein ranging up to 8' width, with richest portions carrying up to 25% copper, and having about 50,000 tons of ore reserves. The Paramatta has been given a modern hoisting and dressing plant, concentrator being of 200 tons daily capacity, and smelter of the same size. The Yelta mine, taken over, 1903, from the New Yelta Copper Mining & Smelting Co., Ltd., is being reopened on a fair scale, and equipped with modern machinery. Production, 1903, was 20,646 long tons of ore, yielding a profit of £8,965. Company paid 25% dividends in 1903, and 5% dividends in 1904.

PARINGA COPPER MINES, LTD.

AUSTRALIA.

Letter returned unclaimed from former office, 34, St. Mary Axe, London, E. C., Eng. Mine office: Callington, Adelaide, South Australia. W. Davis, manager, at last accounts. Capitalization, £200,000. Lands, 172 acres, 36 miles from Adelaide.

PARK CITY MAJESTIC MINING CO.

UTAH.

Presumably dead. Was organized on a bond and lease. Present whereabouts of S. T. Rolph, the promoter, are unknown.

PARK GOLD & COPPER MINING CO.

IDAHO.

Mine office: Mullan, Shoshone Co., Idaho. Thos. F. Kelly, principal shareholder. Patrick Burke, manager. Has 2 tunnels, lower, 1,000' long, mainly on a vein, said to be 20' wide, giving a good showing of native copper.

COMPAÑIA EXPLOTADORA DE PARRAL.

MEXICO.

Mine office: San Bartolo, Durango, Mexico. Property includes El Lencisco mine, carrying auriferous copper ore. Employed circa 40 men, at last accounts.

PARRAL SMELTING CO.

MEXICO.

Office: care of Samuel Garrison, president, Pittsburg, Pa. Works

office: Parral, Chih., Mex. D. M. Evans, general manager. Capitalization, \$1,000,000. Property is a smelting concession, from the State of Chihuahua, and it is planned to build a 250-ton smelter, with both lead and copper stacks.

PARROT SILVER & COPPER CO.**MONTANA.**

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Employs about 400 men. Chas. H. Dickey, president; Chas. D. Burrage, secretary; John D. Ryan, managing director; preceding officers, Richard D. Willard, Edw. G. Storey, A. W. Bemis and Sidney Chase, directors; Harry A. Galway, superintendent. Organized 1880, under laws of Montana, with capitalization \$2,300,000, shares \$10 par; issued, \$2,298,500. Is controlled, through ownership of majority of stock, by the Amalgamated Copper Co. Paid dividends, to end of 1905, of \$6,347,560. Paid quarterly dividends of 50 cents per share during 1905, but dividend rate was reduced, 1906.

Lands, 19 claims, mainly fractional, area 40.6 acres, well located, in the central portion of the Butte district. The Parrot was opened 1884, and is one of the pioneer mines of the camp. A barren zone occurs at a depth of about 1,000', but good ore bodies are found below. The ore averages about 3.5% copper and carries fair silver and gold values. Properties operated are the Parrot, Little Minah, Bellona, and Original No. 6 mines. The Little Minah has a 1,000' two-compartment shaft and is connected underground with the Nipper. The main shaft of the Parrot, 1,900' deep, has three compartments to the 4th level and 4 compartments below, being connected underground with the Colusa-Parrot, Never Sweat, Nipper and Original No. 6 mines. The shaft was retimbered, 1904, and the mine is timbered with 10x10" square and round timbers, and has electric call-bells. In May, 1906, the bottom level showed a 30' vein, apparently a continuation of the Anaconda vein, carrying high-grade chalcocite and bornite. The shaft has a 112' steel gallows-frame, weighing 125 tons, with a maximum load capacity of 50 tons. The Parrot shaft has a Union Iron Works hoist, with 28x96" cylinders, capable of raising 10-ton loads from a depth of 3,000', hoisting two double-deck cages with 10-ton skips swung under, using a flat steel rope $\frac{5}{8}$ " thick and 8" wide. Machinery plant includes an 80-drill Ingersoll-Sergeant air-compressor and a 22-drill Rand compressor. Mine buildings are mainly of steel, stone and brick, these including an engine-house, boiler-house, compressor-house, various shops and a model two-story changing-house with cement floors, 24 shower-baths, and lockers for 350 men. The mine has an antiquated smelter, idle since 1900, ores being reduced at the Washoe plant of the Anaconda. Company also owns copper refining works at Bridgeport, Conn., these also being antiquated and idle.

Production is not made public, but is estimated at 9,000,000 lbs. fine copper only for 1905, but should be larger for 1906. The settlement of the Amalgamated-Heinze litigation places the Parrot in a much better position than formerly, and, barring misfortunes, the mine should make nearly 12,000,000 lbs. fine copper during 1906.

PARRY SOUND COPPER MINING CO., LTD.**ONTARIO.**

Office: 604 Germania Life Insurance Bldg., St. Paul, Minn. Mine office: Parry Sound, Muskoka district, Ont. Robert Forbes, agent. Lands, circa 14,000 acres, including the McGown and Wilcox mines, on the eastern shore of Georgian Bay. Ores are auriferous chalcopyrite and bornite. Has a 10-stamp mill. Idle.

PAR VALUE CONSOLIDATED GOLD & COPPER CO.**COLORADO.**

Attempted, 1905, apparently to avoid payment of debts, to secure a new bond and lease, through sundry directors. Latter kept the bond and company apparently is hopelessly insolvent—hoist by its own petard.

PAR VALUE GOLD MINING CO.**COLORADO.**

Succeeded, 1900, by Par Value Consolidated Gold & Copper Co.

GEWERKSCHAFT PASCHA.**GERMANY.**

Office: Düsseldorf, Rheinprovinz, Germany, Paul Müller, president. Has ores of iron, copper, zinc and lead, employing circa 25 men, at last accounts.

PASS CITY COPPER CO.**MEXICO.**

Office: care of H. E. Runkle, El Paso, Texas. Lands, sundry claims, in the Sierra de Las Arradas, district of Bravos, Chihuahua, Mexico, developed by two shafts, one tunnel and an open-cut, with a total of about 350' of openings, showing stringers of oxide and carbonate copper ores, in limestone.

PATHFINDER CONSOLIDATED MINES, LTD.**BRITISH COLUMBIA.**

Mine office: Grand Forks, Yale district, B. C. Ores carry gold, silver and copper. Has steam power. Presumably idle.

PAUDORNE COPPER MINING CO.**VIRGINIA.**

Company refused to accept a letter addressed to Houston, Virginia. Organized December, 1902, under laws of South Dakota, to do a general mining business in Virginia. Seems suspiciously reticent.

PAVO RICO MINING CO.**MEXICO.**

Controlled by Atlas Exploration & Mining Co.

PAYMASTER COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Wyo.

PAYMASTER MINE.**ARIZONA.**

Owned by Grand Gulch Copper Mining Co.

PEACH BOTTOM COPPER CO.**NORTH CAROLINA.**

Letter returned unclaimed from former mine office, Elk Creek, N. C.

PEACOCK COPPER CO.**CALIFORNIA.**

Dead. Described in Vols. IV and V.

PEAK COPPER CO.**MICHIGAN.**

Former secretary of company claims corporation never was organized.

PEAK MINE.**AUSTRALIA.**

Mine office: Peak Downs, Clermont, Central Queensland, Australia. Very rich ore was obtained, at the opening of the mine, and property paid £278,250 profits to shareholders, after trucking ore about 300 miles. An attempt to reopen the mine, circa 1898 was frustrated by a decline in copper

and the death of the manager. Property is freehold and exempt from labor conditions. Mr. W. Lees, of Brisbane, states that a considerable tonnage of ore is in sight, and that the property is worthy of investigation.

PEARL COPPER MINING CO.**COLORADO.**

Letters returned unclaimed from former mine office, Pearl, Colo.

PEARL COPPER MINING & SMELTING CO.**COLORADO.**

Office: care of P. B. Coolidge, manager, Lander Wyo. Mine office: Pearl, Larimer Co., Colo. W. L. Culbertson, president; R. E. Coburn, secretary; T. J. Riley, superintendent. Lands include the Copper King and Swede groups, opened by a 400' shaft, showing considerable ore of excellent average grade, values being in copper, gold and silver. Has steam power. Is under lease, expiring 1906, to Western Mining & Smelting Co.

PEARL & LILLIE MINES.**COLORADO.**

Mine office: Newett, Chaffee Co., Colo. F. H. Denman, superintendent, at last accounts.

PEARL SMELTING CO.**COLORADO.**

Works office: Pearl, Larimer Co., Colo. Is controlled by the National Mining & Milling Company. Plant is a small smelter, partly completed, at last accounts, planned eventually to include a 36x66' power-house with a 175-h. p. steam plant, 20x24' smithy, 21x50' office, ore-bins, a 54x62' main furnace building, of steel, having a 175-ton blast-furnace, with two 80-h. p. boilers, a 150-h. p. engine and a No. 7 Connorsville blower. Company seems to have met with unexplainable delays in putting its smelter in blast, and works are not regarded as a serious attempt as a reduction plant.

PECOS COPPER CO.**NEW MEXICO.**

Office: 581 Arcade, Cleveland, Ohio. Mine office: Cowles, San Miguel Co., N. M. Employs 40 men. Alfred H. Cowles, president; I. C. Clifford, vice-president; Frederick H. Swan, secretary and treasurer. Organized 1904, under laws of Michigan, with capitalization \$50,000, shares \$25 par, as a development company, and plans reorganization, with greatly increased capitalization, after opening of mines to a size warranting such action.

Lands, 15 claims, of which 7 are held under option, also miscellaneous lands, giving total holdings of 1,200 acres, in the Hamilton district, circa 12 miles over the mountains from Santa Fé, near the Pecos river. Lands are well timbered, and a considerable water power is available from the river. Country rocks are granite, slate and quartzite, with underlying strata of lower Carboniferous age, cut through by the valley of the Pecos river. Property shows sundry contact veins, having a ferruginous quartzite on the south, with granite and slate to the north, of which 2 veins, under development, show a mineralized zone ranging up to 225' in width, with ore bodies of 12' to 80' width, carrying massive chalcopyrite and massive sphalerite, former giving average assays of 3.5% copper, 3.75 oz. silver and \$1.60 gold per ton. Development is by the Katydid shaft of 60' and the Evangeline shaft of 310', with 450' of tunnels and about one-half mile of workings in all. An 18" vein of coal has been opened by 470' of tunnels. Property

was opened 1882, and closed shortly thereafter, owing to the zinc ores near surface proving unworkable. Recent developments show a 44' vein of sphalerite, carrying 1% to 5% copper, and \$1 to \$5 gold and silver values per ton. The zinc ores will require special treatment, but the copper ores, being rich in sulphur and iron, are well suited to pyritic smelting.

Equipment includes a 165-h. p. steam plant, with 2 hoists, good for 600' each, and a 3-drill Rand air-compressor. The mine has several buildings and is 17 miles from the Santa Fé railway. Company seems managed conservatively, and property gives promise of making, with adequate development, a large low-grade copper mine.

PEERLESS GOLD & COPPER MINING CO.

Office: 153 La Salle St., Chicago, Ills.

PEERLESS MINING & MILLING CO.

COLORADO.

Office and mine: Salida, Chaffee Co., Colo. Lands, 6 claims, on Cyclone Mountain, 16 miles west of Salida, opened by an 800' crosscut tunnel, showing ores carrying values in lead, copper, gold and silver, lead predominating. Presumably idle.

PEHOVAZ HERMANOS y CA.

PERÚ.

Mine office: Uliachiu, Cerro de Pasco, Junin, Perú. Firm operates a mine that is a small producer of silver and copper.

PELLON COPPER KING MINES.

ARIZONA.

Lands, sundry claims, in vicinity of Tucson, Pima county, Arizona.

PEÑA COPPER MINES, LTD.

SPAIN.

Offices: 3, Laurence Pountney Hill, Cannon St., London, E. C., Eng. Mine office: Nerva, Huelva, Spain. Carl Heinrich von Siemens, chairman; Nicol Brown, deputy chairman; preceding officers, Carl Chrambach, Chas. Laudour, Baron C. H. Von Merck, A. Straube and Arthur Spitzer, directors; T. Stevenson, Dick, secretary; T. D. Lawther, general mine manager; Wm. Neil, auditor; Budd, Johnson & Jecks, solicitors; London & Westminster Bank, bankers. Organized Sept. 19, 1900, with capitalization increased January, 1905, to £600,000, shares £1 par; issued, £514,600. Debentures, £200,000 authorized, at 5%; £81,000 outstanding, bonded indebtedness having been reduced from £193,800 debentures issued. For fiscal year 1905, net profits were £17,293, from which a 4% dividend was paid. Lands, 183 hectares, 2 miles northeast of the Rio Tinto, being the Peña del Hierro group of 17 old mines, taken over from the Sociedad Peninsular de Brussels. Extraction is mainly from open pits, and large quantities of overburden are removed, the amount of stripping done in 1905 having been 195,430 cubic metres. Eventually the capping will be removed entirely, and the mine worked open-cast, down to the ninth level. Present extraction is mainly opencast, though some underground mining is done. Reserves are estimated at upwards of 2,000,000 long tons.

Ores produced are divided into cupreous pyrites, iron pyrites and washed sulphur ore, latter being ores previously leached for copper, and sold later for sulphur contents. The mining plant is modern and complete, including hoists, crushing plant, shops and dwellings. The leaching plant has settling

tanks, boilers, pumps, etc. A 2½-mile private railway, equipped with one locomotive and 14 cars, connects the mines and works with the nearest railway. The cupriferous iron pyrites of the Sierra Morena lend themselves with special aptitude to copper extraction, by a combination of natural weathering and artificial leaching, and this process, in use by the Peña, gives cheap costs, but entails long waits and tremendous investments before profits are returned, an average of 8 to 10 years being required to extract all copper values, which means that the operators must put more in than is taken out, for this length of time. For 1902 the actual production of refined copper was only 624 long tons, although the ores placed in process of extraction were estimated to carry 2,700 long tons, and in 1905, the discrepancy, though not so marked, was very great, about one-third of the copper mined being put on the market. Production, 1905, was cement copper carrying 1,724,800 lbs. fine copper and circa 110,000 long tons of pyrites, sold for sulphur contents. At the close of 1905 the quantity of ore in the tereros, or leach-heaps, was 480,803 long tons. Eventually the annual discrepancy between ore production and copper production will be overcome, and the profits will be correspondingly great. The property is of great value, and has an excellent management.

SOCIEDAD ANONIMA MINERA DE PEÑAFLO.

SPAIN.

Office: Bilbao, Vizcaya, Spain. Mine office: Peñaflo, Sevilla, Spain. Don Luis de Salazar, president; Don P. Alzaga, manager; Don Angel Iznarde y Alzate, superintendent. Organized Jan. 1, 1901, under laws of Spain, with capitalization 4,500,000 pesetas. Property includes the Concepción, Descuido and Segunda Preciosa mines, which were unwatered by an electric pumping plant, and were preparing for production upon a considerable scale, at last accounts.

PEND D'OREILLE GOLD & COPPER MINING CO.

WASHINGTON.

Mine office: Davenport, Lincoln Co., Wash. Presumably idle.

PENINSULA MINING & SMELTING CO.

MEXICO.

Lost property, circa 1904. Fully described in Volume V.

SOCIEDAD PENINSULAR DE BRUSSELS.

SPAIN.

Wound up, 1900, and mines sold to Peña Copper Mines, Ltd.

PENN CHEMICAL WORKS.

CALIFORNIA.

Office and mine: Campo Seco, Calaveras Co., Cal. Employs 175 men. J. K. Harmon, president and general manager; Albert C. Harmon, secretary, treasurer and superintendent; A. L. Willie, assistant superintendent; John Cocking, mine foreman; Frank Baird, smelter superintendent. Organized 1880, under laws of California.

Lands, 4 claims, area 80 acres, patented, also a 20-acre smelter-site, 640 acres of timber lands and 450 acres miscellaneous lands, giving total landed holdings of 1,190 acres, in the Campo Seco district. Property includes the Campo Seco, Hecla, and Satellite mines, which were considerable producers, circa 1860-1870. Mines were developed by 5 tunnels and 2 shafts, latter of 500' and 700', cutting a 30' ore body, at depth of 400'. Ore is slightly argentiferous and auriferous chalcopyrite, associated with sphaler-

ite and iron pyrites, with gangue ranging from talcose schist, through clay, to quartz.

Equipment includes steam plants of 150 h. p. at the mine, and 400 h. p. at the smelter. Shafts have 44-h. p. and 100-h. p. hoists, good for depths of 1,000' and 2,000', with a 14-drill Ingersoll-Sergeant air-compressor. Buildings include a 25x30' machine-shop, 16x24' carpenter shop and 12 miscellaneous structures.

The smelter, $\frac{1}{4}$ mile from the mine, receives ore by tram, and is equipped with a 100-ton blast-furnace and 50-ton reverberatory furnace, turning out matte, brought to 60% copper tenor in three heats, shipped to the American Metal Co., Ltd., New York, for refining. Management is said to plan installation of 8 roasters. Property is served by the Southern Pacific railway, 6 miles distant, and a branch may be built from Bruson to Campo Seco. Fuel is petroleum for power purposes, and coke for smelting. A little copper cement is produced by leaching the old waste-burrows. Management is considered good, and property promising.

PENN MINING CO.

CALIFORNIA.

Title changed to Penn Chemical Works.

PENN MINE.

MICHIGAN.

Mine held by Lake Copper Co. Fully described in Volume II.

WILLIAM PENN MINING CO.

WYOMING.

Office: Lewisburg, Pa. Mine office: Encampment, Carbon Co., Wyo. J. E. Hedding, president; J. W. Van Valzale, secretary and treasurer; S. E. Phelps, manager. Organized, 1903, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; Lands, 3 claims, area 60 acres, in the Upper Platte district, showing a 4' vein carrying carbonate ores and chalcopyrite, opened by a 75' shaft. Idle.

PENNSYLVANIA AND CANANEA COPPER CO.

MEXICO.

Offices: 52 Broadway, New York, and 522 Bradbury Building, Los Angeles, Cal. Mine office: Baca Bldg., La Cananea, Sonora, Mexico. Robert Mitchell, president and general manager; Henry J. Stevens, vice-president; E. B. Crary, treasurer; Geo. A. Fitch, secretary; T. H. Collins, superintendent. Organized under laws of Arizona, with capitalization \$5,000,000, shares \$10 par; issued, \$2,500,000. Lands, 587 pertenencias, including the Collins group, of 305 pertenencias, Arizpe group, of 40 pertenencias, Homestake group, of 60 pertenencias, Last Chance group, of 32 pertenencias, and Gladys group, of 150 pertenencias, latter adjoining the Massey mine of the Greene Consolidated. Has secured considerable development and company plans production by shipping ore to the works of the Naco Smelting & Refining Co., when built.

PENNSYLVANIA CENTRAL GOLD MINING CO.

COLORADO.

Mine office: Russel Gulch, Gilpin Co., Colo. J. J. Riley, superintendent, at last accounts. Property is the Delaware Chief mine, carrying ores of gold, silver and copper. Has steam power.

PENNSYLVANIA COPPER CO.

NEW MEXICO.

Office: Lyndhurst Blk., Shamokin, Pa. Letter returned unclaimed

from former mine office, San Pedro, Santa Fé Co., N. M. Thos. A. Lister, Albuquerque, N. M., president and general manager; M. F. Nagle, secretary and treasurer. Lands, 9 claims, area 180 acres, in Bernalillo county, New Mexico. Has 8 fissure veins, of which one is developed by a 230' shaft, ore from which has given smelter returns of 21% copper and 13 oz. silver per ton. Presumably idle.

PENNSYLVANIA COPPER MINING CO.**PENNSYLVANIA.**

Office: 1208 Arch St., Philadelphia, Pa. Mine office: Pottstown, Montgomery Co., Pa. Franklin D. Hoffman, president; Edwin J. Quigley, vice-president; Paul Morris, secretary and treasurer. Organized December, 1902, under laws of Delaware, with capitalization \$200,000, shares \$1 par. Lands, 176 acres, 2 miles from Pottstown, slightly developed by a shallow shaft, with a few short drifts, showing ores assaying 5% to 10% copper. Installed a 50-ton water-jacket blast-furnace, in 1904. -Not favorably regarded, and presumably idle.

PENNSYLVANIA MINE.**WASHINGTON.**

Letter returned unclaimed from former mine office, Egypt, Wash.

PENNSYLVANIA MINING CO.**NEW MEXICO.**

Office: Franklin, Pa. Mine office: Los Cerillos, Santa Fé Co., N. M. Wm. A. Brown, superintendent. Ores carry gold, silver, copper and lead. Has gasoline power. Presumably idle.

PENN-WYOMING COPPER CO.**WYOMING.**

Office: 731 Monadnock Bldg., Chicago, Ills. Mine office: Rudefeha, Carbon Co., Wyo. Works office: Encampment, Carbon Co., Wyo. E. M. Cobb, president and general manager; Frank Burke Draper, first vice-president; John J. Malloy, second vice-president; E. A. Norton, secretary; L. M. Fishback, treasurer; preceding officers, J. R. Leonard, Frederick Davidson and D. H. Lambertson, directors; E. K. Hum, general manager; Geo. H. Hand, superintendent. Organized September 13, 1904, under laws of Wyoming, with capitalization \$10,000,000, shares \$1 par, succeeding the North American Copper Co., which was organized 1902, under laws of New Jersey, with capitalization \$20,000,000, shares \$100 par. The Penn-Wyoming Copper Co. claims to be sole owner and operator of the following subsidiary companies: Encampment Smelting Co., Encampment Tramway Co., Encampment Pipe Line Ditch Co., Encampment Water Works Co., Encampment Land & Town Lot Co., Haggarty Copper Mining Co., Carbon-dale Coal Co., Emerson Electric Light Co. and North American Mercantile Co. Early in 1906 the Penn-Wyoming secured 2,250,000 shares of stock of the Battle Lake Tunnel Site Mining Co., owner of the Doane-Rambler mine, same being 90% of the capital stock of the Battle Lake company, giving therefor 743,000 shares of Penn-Wyoming stock.

Lands, 5 claims, area 103 acres, patented, including the Ferris-Haggarty and Osceola mines, also a 24-acre millsite and 207 town lots, in the Bridger district. The Ferris-Haggarty mine shows an outcrop of decomposed, spongy limonite, with carbonate copper stains, underneath which is a fissured zone of about 20' average width, having a mica-schist

hanging-wall and slightly stratified quartzite footwall, with a strike of northwest and southeast and dip of 50° to the southwest, with diorite dikes on either side of the wall rocks. At a depth of about 40' the ore is massive bornite, carrying 30% to 45% copper, and \$2 to \$9 gold per ton. This rich zone practically has been worked out, the bornite being replaced by disseminated chalcopyrite in the lower levels, claimed by company to average 10% copper, 1.75 oz. silver and \$6 gold per ton, but actually carrying about half these values. Mine is opened by a 600' shaft and 1,400' tunnel, these connecting and permitting economical ore extraction through the tunnel, by compressed air locomotives. Mine has about one mile of workings, and is estimated by the company, to have 150,000 tons of ore blocked out for stoping.

The Doane-Rambler property includes 30 claims, area 600 acres, with 80 acres of miscellaneous lands, showing country rocks of granite, diorite and quartzite, carrying numerous veins, of which 5, under development, average about 4' width, showing oxidized ores above and sulphides below, latter mainly chalcopyrite, but with considerable chalcocite, covellite and bornite, which have given average assays of 40.7% copper, from carload shipments. Mine is opened by a 500' working shaft and 3 long tunnels, with nearly a mile of workings. The Doane-Rambler is regarded as a promising mine.

The power plant of the Ferris-Haggarty, at the mouth of the tunnel, includes a 240-h. p. steam plant, with 4 hoists, a 25-drill air-compressor, and a 3-stage Norwalk air-compressor furnishing air at 1,200 lbs. pressure to a 5x8" Porter locomotive, used for underground traction. The mine uses 24 power drills, when working. Buildings include a 30x40' wooden machine shop, 20x40' wooden carpenter shop, 25x32' wooden smithy, offices, warehouse, bunkhouse, eating-house and 14 dwellings.

The smelter, at Encampment, is 16 miles from the mine, and connected therewith by a Leschen aerial tramway, which is the longest installation of the sort ever made. The tram is built in 4 sections, of 4 miles each, and is operated by steam power, generated at three stations, 4 miles apart, each station having storage-bins. The length of cables is 293,275'; weight of cables, 439,669 lbs.; number of tension stations, 16, four being double; greatest elevation above sea level, 10,690', on Bridger Peak; highest tower, 69'; number of towers, 170; highest span, 250' above surface, at Heaning's Gulch; longest span, 2,200', across Cow Creek cañon; general rise, 900'; number of buckets, 840; capacity 700 lbs. each; speed, 4 miles per hour; maximum daily capacity, 984 tons. Plant has automatic filling and discharging devices and was built so that its capacity can be doubled, if desired. Management plans building a 3-mile spur of the main aerial tramway, to reach the Doane-Rambler mine.

The main power plant, at the mill and smelter, uses mainly water power, water being brought 4 miles through a 48" wooden pipe-line, from a 23' dam on the south fork of the Grand Encampment river, developing 750' nominal h. p., driving 5 turbine wheels, 2 of which are connected by shafting and rope-drive with concentrating machinery, the other 3 wheels being used

to generate electric power. In practice the water plant has proven inadequate, and somewhat unreliable, and the company plans replacing same with a steam plant throughout.

The concentrator, which was 250x350' in size, was burned March 20, 1906. The mill is said to have been well insured, for \$100,000, and management is said to plan replacing same promptly.

The smelting plant, of 500 tons nominal daily capacity, is located at Encampment, on the west branch of the Grand Encampment river, and includes a small but complete sampling mill. The smelter proper has a 100-ton Davies straight-line calciner, a 40-ton straight-line mechanical roaster and 2 water-jacket blast-furnaces, originally rated at 200 tons and 300 tons, but which in practice gives an aggregate efficiency of about 350 tons daily. The converter department has a 20-ton electric crane, 3 stands, 6 shells of the Copper Queen type and a 7' silica mill, linings being made of a mixture of quartz and clay, and replaced after every second charge. A White mineral press briquettes fines and flue-dust. Blowers for blast-furnaces and air-compressor for converters are driven by water-power, with electric power for cranes, slag-line and miscellaneous uses. Final product of the smelter is a blister copper of 99.3% copper tenor. In February, 1906, the management was said to plan enlarging the smelter.

Fuel for power purposes is wood, costing \$3.50 per cord, and the company has mines of lignite at Carbondale, 12 miles from Encampment, on the line of the aerial tram. Coke for smelting costs \$12 per ton, owing to high transportation charges, caused by lack of rail connection.

The Penn-Wyoming has been handicapped, from the start, by lack of railroad facilities, the smelter being 45 miles from Wolcott, the nearest railroad station, on the Union Pacific railroad. The absolute necessity of rail connections, pointed out in previous years, has been recognized at last by the management, and arrangements have been made for the building of a line, to be known as the Saratoga & Encampment Railroad. Work was begun, late in 1905, and at last accounts about one-third of the line was graded. On June 6, 1906, the Penn-Wyoming company stated that the promoter of the railroad, Col. E. H. Power, had money in hand to complete the line, and it is to be hoped that the railroad will be completed promptly, as, until it is built, the Penn-Wyoming cannot be made a success.

The mine secured more or less production in 1902 and 1903, and the smelter was blown in again, June 28, 1905, running continuously until October 20, 1905, and making, in that campaign, 2,385,629 lbs. fine copper, 3,549 oz. silver and 226 oz. gold, from 28,039 tons of ore smelted, from which figures it is evident that the average amount smelted daily was slightly under 300 tons, and that the net returns were 4.25% copper, per ton of ore smelted. Company gives estimated average costs of \$2.50 per ton for mining, 80 cents for concentrating, and \$7.50 for smelting, with average estimated cost of 7 cents per ton for refined copper. If these costs, per ton of ore, actually were realized in the smelting campaign of 1905, the actual

cost of blister copper per pound would have been 12.7 cents per ton, and deducting $\frac{1}{4}$ cent per pound, for contained gold and silver values, the cost would have been 12.45 cents per pound, and, allowing for freight and refining costs, could not have been less than 14 cents per pound, or just double the cost claimed by the company. Allowing for general expenses, it is doubtful if any profit whatever was made on the production of 1905, although the company claimed, at the time, to be making copper at a net profit of more than 8 cents per pound. Receipts from production of 1905, less refiners' charges, are given at \$349,555.47, or 14.65 cents per pound.

The old North American Copper Co., succeeded by the present company, in 1904, was badly overcapitalized, and was not conservatively managed. Shareholders of the North American have sued the Penn-Wyoming, alleging that they were not given a proper opportunity to protect their interests by exchanging stock of the old company for stock in the new company. The assets of the North American Copper Co. were sold at public vendue, in 1904, for much less than the debts of the corporation, depriving the stock of all value, except through possible recovery by litigation. The North American shareholders asked for a receiver for the Penn-Wyoming, and that the court issue injunctions against the Penn-Wyoming and its 9 subsidiary corporations, but this the court refused to do. It has been said, but not verified, that the smelter was closed because of proceedings brought by the dissatisfied shareholders of the North American Copper Co., but a satisfactory reason for the closing down of the smelter is found in the foregoing figures of cost.

Mr. Cobb, present president of the Penn-Wyoming, was connected with Mr. John S. Carey, of Denver, in the organization of the old North American Copper Co., which went out of business, as before stated, under circumstances very displeasing to shareholders, and not especially creditable to the management. The Penn-Wyoming Copper Co. has some sort of close working arrangement with the Equitable Securities Co., of Chicago, by which the latter places the stock of the Penn-Wyoming.

The Penn-Wyoming Copper Co. has furnished a large number of statements to the Copper Handbook, but has failed, though repeatedly requested to do so, to furnish a statement on the regular blank form sent to all copper mining companies, this form covering, among other things, the matter of finances. The management of the Penn-Wyoming apparently is willing to give full details regarding its mines, works and operations, except on the point of finances, and this is the vital point. The property undoubtedly is valuable, but the most valuable mine cannot be made a success, unless its finances are properly handled. Direct titles to the assets of the Penn-Wyoming company apparently are held by 9 subsidiary companies, in addition to the Battle Lake Tunnel Site Mining Co. deal. Early in 1906 the company filed a report with the state of Wyoming, under the voluntary publicity act, devised by the state geologist, Prof. H. C. Beeler, a law that is to be highly commended, as giving mining corporations an opportunity of placing themselves squarely on record in an official manner. The report of the Penn-

Wyoming, however, is very incomplete as to finances, but gives liabilities of 666,000 shares of stock, being balance due on mine purchase, also cash due on same, \$150,000, with bills payable, \$508,510, and cash on hand, \$86,000—notwithstanding which the company was paying dividends at the time this report was filed. The company has been said to owe a balance of at least \$425,000 on the Ferris-Haggarty mine, but this figure lacks verification.

The property of the Battle Lake Tunnel Site Mining Co. was not bought outright, in 1906, as stated in the press, but a 90% stock interest was secured, according to the statement of the company. It appears, however, that this stock is being secured by an exchange of 733,000 shares of Penn-Wyoming stock therefor, subject to Battle Lake Tunnel Site Mining Co. shareholders agreeing individually to such exchange. There is much dissatisfaction on the part of the Battle Lake shareholders, over the proposed basis of exchange, which does not take into consideration the number of shares, but offers Penn-Wyoming stock in exchange, at a fixed price, on the bases of the various prices paid by the Battle Lake shareholders for their holdings in that company. Furthermore, the Battle Lake shareholders are not given stock immediately, but are being given non-negotiable receipts, for which stock is promised in January, 1907, thus depriving the Battle Lake shareholders of participation in dividends, and of the ability to secure stock certificates that can be disposed of in the open market.

The Penn-Wyoming's first dividend, of $1\frac{1}{2}\%$ on par, was paid July, 1905. The company advertised September, 1905, to be paying monthly dividends, at the rate of 6% per annum, on par, and was then selling stock at about 50 cents per share.

The stock of the Penn-Wyoming Copper Co. may be divided into three classes, of which the first is treasury stock, being sold as opportunity offers, secondly, issued stock held in escrow until 1907, and not receiving dividends, while the third class is the non-negotiable receipts issued to shareholders of the Battle Lake Tunnel Site Mining Co., which, to all practical intents and purposes, is the same as the escrow stock. It is supposed that dividends are being paid only on treasury stock that has been sold for cash, but, on this point, as on many others, the company displays such reticence that the assertion can be made only as probable, rather than as certain. Dividends are said to have been paid on about 500,000 shares only, and dividends were paid as late as March, 1906.

The reasons given by the management of the Penn-Wyoming Copper Co. for selling stock and paying dividends simultaneously are unsatisfactory. Any company that does this necessarily rests under a cloud, and while the property of the company is considered unusually promising, the financial management is of such a nature that the company must be regarded with suspicion, until the management is willing to make public, to shareholders and intending investors, a balance sheet that will stand close scrutiny, and until the payment of unearned dividends is stopped. Unless these things are done, and done promptly, the Penn-Wyoming is liable to follow its predecessor, the North American, to the scrap-heap.

SOCIEDAD ANONIMA MINAS DE PEÑUELAS.**SPAIN.**

Office and mine: Alosno, Huelva, Spain. Don José Marie de Soto, president; Don Antonio Abad Sánchez, treasurer; Don Antonio Repiso Arribas, secretary. Lands, 130 hectareas, carrying cupriferous iron pyrites.

PERCIVAL MINE.**WISCONSIN.**

A prospect, in Chippewa county, Wisconsin, slightly developed, 1898-1899.

PERCY-CHESTER CONSOLIDATED MINING CO.**COLORADO.**

Office: Council Bluffs, Iowa. Mine office: Red Cliff, Eagle Co., Colo. F. M. Donald, lessee; B. A. Hart, superintendent. Ores carry gold, silver and copper. Has steam power.

CRESCENCIO PEREZ.**MEXICO.**

Office and mine: Mineral de Asientos, Aguascalientes, Mexico.

FRANCISCO DE P. PEREZ.**CHILE.**

Operates the Central mine, opened 1880, in the department of Santiago, Chile. Has a matting furnace and produces matte equivalent to 500,000 to 600,000 lbs. fine copper yearly.

PERKIOMEN MINES.**PENNSYLVANIA.**

Old and idle mines at Shannonville, Montgomery Co., Pa. Were extensively worked, and produced a large variety of copper and lead ores, but idle for some years.

PERMIAN & TRANS-PECOS COPPER CO.**TEXAS.**

Texas charter forfeited, 1905, for non-payment of taxes.

PERSON CONSOLIDATED COPPER &**NORTH CAROLINA****GOLD MINES CO.**

Office: 42 Broadway, New York. Mine office: Virgilina, Halifax Co., Va. E. D. Beecher, president and general manager. Organized under laws of New York, with capitalization \$1,000,000, shares \$10 par. Lands, 1,372 acres, in several neighboring tracts, including the Durgy mine, located in Person county, North Carolina. Main shaft, 330'. Vein averages 4' width, carrying ores ranging from 4% to 20% in copper tenor. Has a good steam power equipment and a 50 ton concentrator. When worked, ships concentrates averaging 45% copper and 20 oz. silver per ton, with small gold values, and sends a limited amount of high-grade ore, averaging 30% copper and 10 oz. silver per ton, direct to smelter. Presumably idle.

PERU COPPER SYNDICATE, LTD.**PERÚ.**

Offices: 6, Drapers Gardens, London, E. C., Eng. H. C. Underwood, secretary. Organized Oct. 25, 1905, with capitalization £5,250, in 5,000 ordinary shares at £1, and 5,000 deferred shares at 1s. par.

PERUVIAN COPPER MINING & SMELTING**ARGENTINA.****CORPORATION.**

A still-born corporation, formed to acquire properties of Carranza-Lafone Copper Mining & Smelting Corporation, Ltd.

PETANQUE MINING CO.

Office: 448 Sheedley Bldg., Kansas City, Mo.

DR. CARL PETERS ESTATES & EXPLORATION CO., LTD.**RHODESIA.**

Title changed, October, 1903, to South-East Africa, Ltd.

PETOSKEY MINING CO.

ARIZONA.

Letter returned unclaimed from former mine office, Williams, Arizona.

PETRO MINING CO.

UTAH.

Lands sold, 1905, for \$30,000, to Utah-Apex Mining Co.

PEWABIC MINING CO.

MICHIGAN.

Wound up, 1905. Lands now owned by Quincy Mining Co.

PEYTON CHEMICAL CO.

CALIFORNIA.

Office: 430 Mills Bldg., San Francisco, Cal. Mine office: El Dorado, El Dorado Co., Cal. Works office: Peyton, Contra Costa Co., Cal. Property is the Noonday mine and adjoining claims, in the Diamond Springs district. The Noonday, held under bond and lease, has shipped a little ore to the company's works.

PHI DELTA THETA COPPER MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Dillon, Wyo.

PHILADELPHIA & ARIZONA MINING CO.

ARIZONA.

Office: 614 Real Estate & Trust Bldg., Philadelphia, Pa. Mine office: Choloride, Mohave Co., Ariz. H. T. Goodman, president; E. F. Lukins, secretary and treasurer; E. T. Loy, general manager; W. F. Miller, superintendent; F. R. Brooks, mill superintendent. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, in the Walapai district, include the Minnesota, Merrimac, Connor, Manzanita and other mines, carrying sulphide ores, in fissure veins averaging 6' width, with assay values of 1% to 20% copper, 15 oz. silver and \$6 gold per ton, with a little lead. Development is scattered over a number of different mines, including 20 shafts from 20' to 600' in depth, and a 3,500' tunnel. Has steam and electric power, 10-stamp mill, 150-ton concentrator and other necessary equipment, employing about 75 men. Property considered valuable.

**PHILADELPHIA COPPER & GOLD MINING, MILLING
& SMELTING CO.**

MEXICO.

Office: 507 Drexel Bldg., Philadelphia, Pa. Mine office: Ameca, Jalisco, Mexico. Employs 100 men. Edwin F. Hall, president; Dr. S. C. Runkel, vice-president; Francis J. Fee, secretary; Josiah G. Williams, treasurer; A. F. Hall, general manager; Ernest Koch, mill superintendent; Braulio Medina, mining captain. Organized 1900, under laws of New Jersey, with capitalization \$3,000,000, shares \$1 par. Lands, 73 pertenencias, near San Martin Hidalgo, also a 2-acre millsite, including the Ajax, La Perla, La Concha, San Vicente and other mines. Lands show sundry veins of 3' to 25' width, carrying auriferous and slightly argentiferous chalcoppyrite. The Ajax shows a 12' vein, carrying estimated average values of 7% copper, 2 oz. silver and \$20 gold per ton. The San Vicente group, 12 miles southeast of Ameca, with circa 600' of openings, is claimed to have 100,000 tons of ore blocked out, and was installing a steam hoist, at last accounts. Properties, as a whole, have 8 shafts, of 100' average depth, also 6 shallow shafts, with a total of 8,000' of workings. Equipment includes a steam plant, 25-ton Elspass mill, 25-ton lixiviation plant and 30-ton concentrator.

PHILIPS RIVER GOLD & COPPER CO., LTD.**AUSTRALIA.**

Office: Salisbury House, London Wall, London, E. C., Eng. Chas. Kaufman, chairman; E. Protheroe Jones, secretary; Fred Morgan, mine manager. Organized January, 1906, with capitalization £100,000, shares £1 par. Lands, 247 acres, held under lease and option, in Western Australia. Property includes the Mount Benson mine, having a 200' shaft, the Mount Desmond mine, in a prospecting stage, which is to have a steam hoist, and the Mount Cattlin mine, also a prospect. Equipment includes Babcock-Wilcox boilers, a 1,000' hoist and a 5-drill air-compressor.

PHOENIX CONSOLIDATED COPPER CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Phoenix, Keweenaw Co., Mich. John R. Stanton, president; Wm. C. Stuart, vice-president; J. Wheeler Hardley, secretary and treasurer; Frank McM. Stanton, agent; preceding officers and J. Oppenheim, directors. Organized April, 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; paid in, \$12.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,200,000.00
Amount paid in by conveyance of property.....	500,000.00
Entire amount invested in real estate.....	505,000.00
Amount of personal estate.....	87,307.44
Amount of floating debt.....	159,816.97

Considerable equipment has been sold, since June, 1905, but a considerable indebtedness must remain unliquidated.

Lands, 2,505 acres, in Keweenaw county, Michigan. Five different fissure veins have been opened, and more or less mining done thereon, at various times. The old Phoenix mine, included in the present consolidation, is famous for having produced the largest mass of native copper ever found, this weighing upwards of 500 short tons. The property also carries the Ashbed lode, which has been slightly developed by an exploratory tunnel.

The mine has extensive openings, and a modern equipment. The property was worked for 6 years, without success, and was closed down June 15, 1905. Production, 1905, was only 273,219 lbs. fine copper. The Phoenix Consolidated was described very fully in Vol V, and the various old properties entering into the consolidation are very fully described in Vol. II.

PHOENIX GOLD & COPPER MINING CO.

Office: 218 La Salle St., Chicago, Ills.

PHOENIX GOLD MINING CO.**CALIFORNIA.**

A reorganization, under a new name, of the Mt. Shasta Gold Mines Corporation. Property is an alleged gold mine, etc. Management and methods thoroughly rotten.

PHOENIX MINE.**AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Property is but slightly developed, and presumably is idle.

PHOENIX MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 50 men. Equipment includes an electric air-compressor. In July, 1905, was shipping circa 60 tons of milling ore daily, in addition to producing a little smelting ore.

PHOENIX MINING SYNDICATE.**WASHINGTON.**

Office: Seattle, Wash. Mine office: Berlin, King Co., Wash. Lands include the Mona group, on the east side of Miller river, 2½ miles from a railroad, showing a 60' vein carrying a 20' paystreak of chalcopryite, mainly of concentrating grade, opened by a shaft of 50' and by tunnels of 80', 230' and 700'.

PICACHO BLANCO MINING CO.**ARIZONA.**

Mine office: Morristown, Maricopa Co., Ariz. M. E. Waldstein, president; T. O. Otis, secretary and treasurer. Is a consolidation of the San Domingo Gold & Copper Co. and Exposition Mining Co. Capitalization \$5,000,000, shares \$1 par. Lands, 31 claims, in Yavapai and Maricopa counties, Arizona. Has a 400' main shaft, with free-milling gold ores said to average \$22 per ton. Has gasoline power, a 15-stamp mill and a 25-ton cyanide plant.

MINAS PICACHO y CAMPO RICO.**MEXICO.**

Mine office: Bavispe, Sonora, Mex. B. J. Hone, manager. Ores carry copper, gold, silver and lead. Has water power, arrastras and a small adobe smelter. Idle.

FELIX R. PICASSO.**PERÚ.**

Office and mine: Cabeza Negra, Ica, Perú.

PIC COPPER & GOLD MINING CO. OF**ONTARIO.****LAKE SUPERIOR, LTD.**

Neither office nor lands of company can be located. Property was advertised as "directly north of the Calumet & Hecla," which was a very misleading statement, as lands, if any, must have been on the Canadian shore of Lake Superior. Presumably dead.

PIEDMONT COPPER MINING & SMELTING CO.**VIRGINIA.**

Office: 320 Broadway, New York. Letter returned unclaimed from former mine office, Elkton, Rockingham Co., Va. Maurice D. Brown, president; Jas. G. Blauvelt, vice-president; E. Porter Emerson secretary and treasurer; S. D. Brown, general manager. Organized 1901, under laws of New Jersey, with capitalization \$2,000,000, shares \$100 par, \$30 paid in. Property shows 3 fissure veins, carrying occasional native copper and sulphide ores, with estimated average values of 6% copper, 10 oz. silver and \$15 gold per ton. Veins are said to be persistent and traceable for about a mile, with geological conditions much the same as at the High Top mine, adjoining. Idle for several years.

PIEDRA y CA.**CHILE.**

Office and mine: Caldera, Atacama, Chile. Own a mine having steam power, which employed circa 100 men, at last accounts.

COMPANIA MINERA PIEDRAS VERDES y ANEXAS.**MEXICO.**

Mine office: Alamos, Sonora, Mex. Angel Almado, president; Joaquin A. Mange, superintendent. Has a 350' shaft and 375' tunnel, with steam

power plant. Made several small shipments, 1902, of matte averaging 40% copper, 20% lead and 200 oz. silver per ton. Employed about 75 men, at last accounts, but presumably is idle, owing to the Yaqui Indian uprising.

PIEDRAS VERDES MINING CO.

MEXICO.

Office: El Fuerte, Sinaloa, Mex. Has argentiferous copper ores, slightly developed by tunnel. Presumably idle.

PIERCE MINING CO.

COLORADO.

Letter returned unclaimed from former mine office, Central City, Colo.

PIKE HILL MINES.

VERMONT.

Office: 82 Beaver St., New York. Mine office: Corinth, Orange Co., Vt. Employs 50 men. N. M. Macdonald, president; H. H. Knox, vice-president; H. G. Hunter, secretary; John H. Allen, treasurer; E. L. Smith, superintendent; preceding officers and D. S. Conant, directors; Knox & Allen, engineers. Organized January 9, 1906, under laws of Vermont, with capitalization \$200,000, shares \$100 par. Annual meeting, second Tuesday in January. Lands, 101 acres, freehold, in the Corinth district, showing country rock of mica-schist, carrying lenses of chalcopyrite of estimated average tenor of 3.5% copper. Has 2 donkey hoists, and a concentrator covering 6,600 square feet, equipped with 1 Blake crusher, 2 sets of rolls and 2 magnetic separators. Nearest railroad is the Boston & Maine, 14 miles distant. Production, 1905, was 131,911 lbs. fine copper.

NEGOCIACION MINERA PILARES DE TERAS.

MEXICO.

Mine office: Pilares de Teras, Sonora, Mex. Alberto C. Garcia, superintendent. Is primarily a silver mine, carrying small values in copper, gold and lead, opened by a 1,400' tunnel and 700' main shaft. Has steam power and employed about 200 men, at last accounts.

PILOT KNOB COPPER MINING CO.

NEVADA.

Letter returned unclaimed from former office, Eau Claire, Wis.

LES MINES DE CUIVRE PILOU, LTD.

NEW CALEDONIA.

Entire stock issue held by Caledonia Copper Co., Ltd.

PINAL COPPER CO.

ARIZONA.

Reorganized, 1905, as Arizona Banner Copper Co.

PINE HILL CONSOLIDATED MINING CO.

CALIFORNIA.

Office: 1316-141 Broadway, New York. Mine office: Wolf, Nevada Co., Cal. J. Frank Mase, secretary and treasurer; Cerf Rosenthal, superintendent. Has a copper ledge, claimed to be 100' wide, carrying malachite, azurite, bornite, chrysocolla and native copper, with a gold vein on the footwall and an auriferous gossan capping, opened by a two-compartment main shaft. Also has a gold mine.

PINKHAM MINE.

ARIZONA.

Letter returned unclaimed from former mine office, Chloride, Arizona.

RODOLFO PINOCHET.

CHILE.

Office and mine: Lo Espejo, Santiago de Chile. Operates the Vieja copper mine. Has steam power and employed about 150 men, at last accounts.

PINTO COPPER CO.

NEW MEXICO.

Office: 9 Bartles Bldg., Iola, Kansas. Mine office: Santa Rita, Grant Co.,

N. M. Geo. A. Bowlius, president; F. S. Bennett, secretary and general manager Samuel Allen, superintendent. Organized July, 1902, under laws of South Dakota, with capitalization \$2,500,000, shares \$1 par. Lands, 8 claims, area 121 acres, in the Central district, showing 4 veins, carrying carbonate and sulphide ores said to average 20' width and to carry 2.5% to 12% copper, 3 oz. to 10 oz. silver and \$2 to \$400 gold per ton. Opened by shafts of 65', 75' and 140'. Presumably idle.

PINTO CREEK COPPER CO.

ARIZONA.

Title changed, circa 1902, to Arizona & Hancock Mining Co.

PINTO CREEK MINING & SMELTING CO.

ARIZONA.

Office: 501 German Bank Bldg., St. Joseph, Mo. Mine office: Globe, Gila Co., Ariz. Thos. G. Cockrill, president; Chas. Reiminschneider, vice-president; Grant S. Watkins, secretary; J. W. Castle, treasurer; preceding officers, H. E. Bragg, J. Berger and Geo. B. Bright, directors; G. P. Fuller, superintendent. Organized December 11, 1896, under laws of Arizona, and capitalization increased, 1906, to \$1,250,000, shares \$1 par.

Lands, 21 claims, area circa 430 acres, in the Globe district, showing country rocks of granite and schists, with 6 fissure veins in granite, these having average widths of 3' to 6', carrying sulphide ores giving assays of 4% to 12% copper, 5 oz. silver and \$2 to \$10 gold per ton. Development is by shafts of 40', 70' and 570', and by 8 tunnels of 100' and upwards, 2 longest being 900' and 1,100', mine having a total of about one mile of underground workings. Main development is on the Yo Tambien claim, where a 570' shaft shows a promising body of sulphide ore. The lower tunnel, of 900' length, is connected with the upper workings. The Manitou claim has a 70' shaft and 3 tunnels of 1,500' aggregate length. Equipment includes a gasoline hoist and a 6-drill Sullivan air-compressor.

The property has an old 10-stamp mill and a 30-ton concentrator, connected with the mine by an aerial tram. Milling and concentrating tests were made, December, 1905, under the advice of Dr. L. D. Ricketts and Mr. J. C. Erman, and, as a consequence, the mill is being enlarged and reconstructed, and is to have a new equipment, from the Allis-Chalmers Co. The mill should be completed in the fall of 1906, and will have an initial capacity of 100 tons, with room in the structure for a 250-ton plant.

The management of this company is honest and eternally persevering. Large sums have been expended on the property, and indications are that the courage and persistence of the officers and shareholders will be rewarded by the making of a good mine.

PITKARANTA KOPPARBRUK.

FINLAND.

Mine office: Pitkaranta, Viborg, Finland. The property was in operation for many years, until circa 1903, and was a small but steady producer, making circa 750,000 lbs. fine copper yearly. Ore is carried in a bed of "skarn," which is a granular mixture of augite, garnet and other ferromagnesian silicates, impregnated between the grains with chalcopyrite, which also occurs in veinlets. Ore body is of about 15' width, and is low in grade, and the mine has been opened, more or less extensively, for about 1½ miles along the vein.

PIT RIVER GOLD, SILVER & COPPER MINING CO. CALIFORNIA.

Letter returned unclaimed from former mine office, Redding, Cal.

PITTSBURG & ARIZONA MINING CO. ARIZONA.

Mine office: Charleston, via Johnson, Cochise Co., Ariz. Lands, include the Manila mine, with a double compartment shaft, planned to be sunk 400', showing a promising vein of high-grade ore. Has a steam plant, with hoist, air-compressor and pumps.

PITTSBURGH & BOSTON COPPER CO. MICHIGAN.

Wound up. Property, the Cliff mine, sold to Tamarack Mining Co.

PITTSBURG & CHIRICAHUA DEVELOPMENT CO. ARIZONA.

Mine office: Paradise, Cochise Co., Ariz. Lands, 16 claims, in the Chiricahua Mountains. Idle.

PITTSBURG CONSOLIDATED MINING CO. UTAH.

Office: care of J. E. Hill, Jr., secretary and treasurer, Salt Lake City, Utah. Mine office: Cottonwood, Salt Lake Co., Utah. S. M. Levy, president; J. H. Bigger, general manager; Dan'l Doyle, superintendent. Organized 1903, with capitalization \$300,000, shares \$1 par. Lands, 9 claims, in the Little Cottonwood district, showing a 20' vein, between limestone and shale, carrying values of \$35 to \$40 per ton, with circa 1,500' of workings.

PITTSBURG COPPER MINING & REDUCTION CO. ARIZONA.

Office: 300 Heist Bldg., Kansas City, Mo. Capitalization, \$150,000,000. A swindle, promoted by Theodore Stegner, a notorious promoter of crooked mining schemes. Company held 40 acres of alleged copper mining ground in Box Canyon, on the Bill Williams Fork river, about 50 miles from Congress Junction, Arizona, and also claimed to own other lands, none of which can be located. Company's capitalization is preposterous, and the shares are absolutely worthless. Stegner, at last accounts, was peddling stock to widows, orphans and financially foolish male adults. Stegner has done time before, and should be locked up permanently.

PITTSBURG & DULUTH DEVELOPMENT CO. ARIZONA.

Succeeded, October, 1904, by Pittsburg & Duluth Mining Co.

PITTSBURG & DULUTH MINING CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 80 men. Chas. Briggs, president; James Hoatson, vice-president; Thomas Hoatson, second vice-president; Louis W. Powell, third vice-president and general manager; Gordon R. Campbell, secretary; Peter Ruppe; treasurer; preceding officers, Thos. F. Cole, Geo. E. Tener, C. d'Autremont, Jr., and Chester A. Congdon, directors; Henry B. Paull, auditor; Frank Juleff, mine foreman; E. E. Whiteley, engineer. Organized October, 1904, under laws of Minnesota, with capitalization \$3,000,000, shares \$10 par; issued, \$2,500,000. Annual meeting, second Monday in April. On December 31, 1905, had assets of \$287,925.20 and liabilities of \$16,957.53.

Lands, 17 claims, area 215 acres, patented. Property is surrounded by lands of the Copper Queen, Calumet & Arizona, Lake Superior & Pittsburg and Wolverine & Arizona. The mine is opened by the 1,267' Congdon shaft, on the Black Bear claim, only 650' from the Calumet & Arizona line, and by drift-

crosscuts on the 1,000' and 1,100' levels of No. 2 shaft of the Lake Superior & Pittsburg, and, owing to the very rugged topography of the company's lands, can produce to better advantage through the L. S. & P. shaft than through any shaft that can be sunk on its own lands. The collar of the shaft is 150' above the collar of the Irish Mag shaft of the Calumet & Arizona, hence an allowance of 150' must be made in correlating P. & D. levels connected with C. & A. openings. The shaft is connected with drifts on the 1,000' and 1,100' levels of No. 2 shaft of the L. S. & P., and also with a drift-crosscut from the Irish Mag shaft of the C. & A.

Considerable ore has been developed at various points, especially on the 1,000' and 1,100' level drifts from the Lake Superior & Pittsburg, but the work done so far has been performed more with an idea to opening the mine than to showing big ore bodies. Several ore bodies, apparently merely apexes of large lenses lying lower, have been cut on the 1,000' drift-crosscut, these ranging 5% to 12% in copper tenor, being mainly chalcopyrite, with considerable oxidized ore and native copper. In May, 1906, some good ore was cut in a drift on the Sunnyside claim. In addition to these lenses, diamond drill borings have cut several other ore bodies, apparently richer and larger. The ore now developed is of lower grade than the average of the district, though some very rich ore is shown on the 1,350' level. The mine has a 1,000-gallon pump in a station on the 1,000' level. Ore is raised through No. 2 shaft of the Lake Superior & Pittsburg.

Equipment includes a 300-h. p. steam plant, with a 12x36" double-drum hoist, good for 1,400', and a 5-drill straight-line air-compressor. The physical configuration of the property is such that production can be secured to much better advantage through Cole shaft of the Lake Superior & Pittsburg than through Congdon shaft of the Pittsburg & Duluth. The Superior & Pittsburg Mining Co. has consolidated the Pittsburg & Duluth with the Lake Superior & Pittsburg, Calumet & Pittsburg and Junction mines.

Production, 1905, was 390,179 lbs. fine copper, from 7,069 tons ore smelted, giving smelter returns of only 2.77% copper. The gold and silver product was \$5,589.07, amounting to 79 cents per ton of ore smelted. The production of 1905 was gained in two and a half months smelting, the ores produced being used for fluxing the richer Lake Superior & Pittsburg ores. The P. & D. has richer ores, at greater depth, which will become available later.

PITTSBURG & HECLA DEVELOPMENT CO.

ARIZONA.

Dead. Fully described in Vol. V.

PITTSBURG-IDAHO MINING CO.

IDAHO.

Office: Kamiah, Idaho. Mine office: Greer, Nez Perce Co., Idaho. Employs 7 men. Jas. F. Bridwell, president; Daniel Lavery, vice-president and general manager; Hugh Lavery, secretary and treasurer; E. E. Krengel, engineer; preceding officers, Fred Worrell, Otto Gorke, Jas. Lavery, E. E. Krengel, William S. Pitman and Patrick Lavery, directors. Organized January, 1903, under laws of Idaho, with capitalization \$1,000,000, shares \$1 par; issued, \$675,000. Annual meeting, last Saturday in January. Lands, 19 claims, area 380

acres, in the Lo Lo district, showing 6 contact veins between gneiss and quartz-porphry, of which two, under development, range 50' to 100' in width, giving assays up to 12% copper, 14 oz. silver and \$20 gold per ton, from cuprite, malachite, bornite and chalcopyrite. Has 20 pits and shafts, deepest 180', and tunnels of 40', 290' and 600', with a quarter mile of underground openings. Has gasoline power and 5 small mine buildings. Company plans installing a hydro-electric plant, utilizing power from the Clear Water river, adding a 12-drill air-compressor and continuing underground development.

PITTSBURG-JEROME COPPER CO.

ARIZONA.

Office: 1219 Park Bldg., Pittsburg, Pa. Mine office: Jerome, Yavapai Co., Ariz. Employs 14 men. Thomas Houlette, president; Jos. Atkins, vice-president; C. S. Cochran, treasurer; T. D. McDonald, secretary; preceding officers, W. E. Crow, Robt. Stewart, A. C. Spindler and D. M. Clemson, directors; W. A. Edeburn, consulting engineer; D. S. Cochran, superintendent and engineer in charge. Organized 1904, under laws of Arizona, capitalization increased March 5, 1906, to \$3,000,000, shares \$1 par; issued, \$1,482,699. On May 4, 1906, had cash assets of \$37,707.28, without accrued liabilities. Annual meeting, first Monday in March. Is expending circa \$2,500 monthly, on development.

Lands, 26 claims, area circa 520 acres, lying 2 miles south of Jerome, a short distance northwest of the Black Hills property and about midway between the United Verde and Equator mines. Development is by a shaft, sinking with three 8-hour shifts, 216' deep in April, 1906, planned to be sunk to a depth of 1,000'. Equipment includes a 60-h. p. Fairbanks & Morse gasoline hoist, good for 1,800', an Ingersoll-Rand 2-stage air-compressor, power drills and sinking pump. Development has been hampered by bad weather and a heavy inflow of extremely acid water. Management is good, and property is considered promising.

PITTSBURG-JEROME COPPER & GOLD MINING CO.

ARIZONA.

Succeeded, circa 1904, by Pittsburg-Jerome Copper Co.

PITTSBURG MINE.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. Peter McFarland, superintendent, at last accounts. Ores carry gold, silver and copper.

PITTSBURG MINING & MILLING CO.

IDAHO.

Letter returned unclaimed from former mine office, White Bird, Idaho.

PITTSBURG & MONTANA COPPER CO.

MONTANA.

Office: 1124 Farmers' Bank Bldg., Pittsburg, Pa. Mine office: Butte, Silver Bow Co., Mont. Employs 325 men. J. H. Reed, president; Ralph L. Baggaley, vice-president; David E. Jackman, secretary and treasurer; Oscar Rohn, general superintendent. Organized July 9, 1902, under laws of West Virginia, with capitalization \$30,000,000, shares, \$100 par. Is said to plan a bond issue of \$3,000,000, at 6%, to care for floating debt of company and provide additional working capital. Annual meeting, first Monday in August.

Lands, 46 claims, area 850 acres, also 634 acres miscellaneous lands, giving total holdings of 1,384 acres, in the Butte, Helena, Elk Horn and Greenhorn districts of Montana. The main tract, 260 acres, adjoining Anaconda Hill,

lying circa 2 miles east of the center of Butte, includes the McQueen placer and adjoining claims, formerly owned by Franklin Farrell. This tract is about $1\frac{1}{4}$ mile in length north and south, $\frac{1}{4}$ wide at its narrowest point, and about $\frac{3}{4}$ mile wide where adjoining the Silver Bow mine of the Butte & Boston. This property carries 4 veins of 2' to 12' average width, presumably continuations of the veins of the Butte & Boston. Owing to the great depth of overburden, the solid ledge was not reached until a depth of several hundred feet, and shaft sinking was difficult and costly, owing to the existence of considerable quicksand above the ledge. Development is by 2 shafts, known as Nos. 2 and 3, each of 1,240' depth, with about 4 miles of underground workings. No. 2 shaft has 500-gallon electric pumps on the 700' and 1,200' levels, and the shafts are connected by a half-mile crosscut, on the 1,200' level. Ore bodies are small, compared with the big veins to the eastward, but carry good silver values, ore ranging 3.5% to 12% copper and 8 oz. to 12 oz. silver per ton, with small gold values. In addition to the main property, in Butte, the company owns the Swissmont mines, near Elkhorn, Jefferson county, and the Chamounix mine, near Austin, Lewis & Clark county, Montana. The Elkhorn property, bought for \$60,000, shows a large body of low grade ore, carrying 1.5% to 3% copper, of a character especially adapted to pyritic smelting. The Chamounix property includes the Christina group, of 6 claims, and the Fannie Parnall group of 33 claims. The Christina group has considerable development, and has shipped more or less argentiferous copper ore. The company also owns sundry mining claims at Pittsburg, 4 miles from Helena, Lewis & Clark county, Montana.

Equipment includes a 2,000-h. p. steam power plant and a 600-h. p. electric plant, of which 1,900 h. p. is used at the mine, and 700 h. p. at the smelter. The mine has a 500 h. p. hoist, good for 1,600', and a 600 h. p. hoist, good for 1,300', also a 40-drill Rand air-compressor and 20 power drills. Buildings include a 38x70' brick carpenter shop, frame smithy, 2 engine-houses, 2 boiler-houses, a changing house, office building, laboratory, transmitter station and miscellaneous buildings, with a total of about 16 structures. The office building is equipped with a library, reception room, billiard room and café.

The reduction plant, known as the Pittsmont smelter, is connected by track with the north shaft and has a 200-ton blast-furnace, with room for 4 additional furnaces. The furnace is a remodeled Garretson pyritic smelter, with sundry changes made by Mr. Baggaley, and has given considerable trouble in operation. The Baggaley process of pyritic smelting calls for treating ore without water concentration, heap-roasting or carboniferous fuel. The process is said, by the management, to have been successful, but the supply of ore was inadequate to give the best returns. The smelter has one converter stand with 8x13' shells, and 2 experimental Baggaley converters of smaller size. Product is blister copper, carrying 99% copper, 200 oz. silver and 3.5 oz. gold per ton, sent, for electrolytic refining, to the Nichols Chemical Co., New York.

The property has about 3 miles of railroad track, connecting the various parts of its mine and smelter. Production, 1905, was 790,600 lbs. fine copper, 81,911 oz. silver and 1,422 oz. gold, secured from 11,000 tons of ore smelted, giving average returns of 3.6% copper. The smelter was closed down April 14,

1906. Company plans adding a new hoist and increasing the size of the smelter. Property is considered valuable, though scarcely up to the average of the Butte camp in quantity or quality of ore, but it is evident, from the results secured, that pyritic smelting has not yet been made an entire success.

PITTSBURG & MOUNT SHASTA GOLD

CALIFORNIA.

MINING & MILLING CO.

Letter returned unclaimed from former mine office, Redding, Shasta Co., Cal. B. N. Scott, president; John Parish, secretary. Lands are the Bennington group, adjoining the Mountain Copper Co., showing ores assaying from \$4 to \$300 per ton in gold, silver and copper. Property idle for several years, but considered promising.

PITTSBURG & UTAH GOLD, SILVER, COPPER

UTAH.

& LEAD MINING CO.

Lands are supposed to be in the Ophir district, Tooele county, Utah.

PIZARRO COPPER MINING CO.

NEW MEXICO.

Office: care of Financial Securities & Trust Co., Denver, Colo. Mine office: Silver City, Grant Co., N. M. Claims to have mining property in vicinity of Silver City. Is not favorably regarded.

PLAKALNITZA MEDNA PLANINA.

BULGARIA.

Office: care of M. Mavrokordato, owner, Constantinople, Turkey. Mine office: Plakalnitza, Vratza, Bulgaria. Lands, sundry claims, held as a concession from the Bulgarian principality, showing bornite and a little chalcopryrite, in dolomite. Copper mines were worked in this vicinity by the Romans.

PLANET COPPER MINING CO.

ARIZONA.

Office: 170 Broadway, New York. Branch office: 908 Equitable Bldg., Denver, Colo. Mine office: Planet, via Yucca, Yuma Co., Ariz. J. Stanley Jones, president; W. B. Storer, secretary; H. L. McCarn, superintendent. Organized August 14, 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$10 par. City Trust Co., Boston, registrar. Company is free of debt.

Lands, 25 claims, area 500 acres, also 40 acres in millsites, in the Harecuvar district, on the south side of Bill Williams Fork river, 12 miles east of the Colorado river. Ore occurs in a metamorphic contact between diorite on the foot-wall and overlying sedimentary shales and impure limestone, much altered by intercalated eruptives, the vein carrying a heavy iron capping, mainly hematite, for a distance of circa 3,000', averaging about 30' thickness and up to 200' in width. Apparently the hematite is of workable grade, and it is estimated that 500,000 tons of 60% iron ore are now exposed. Development is by 12 vertical shafts, of 20' to 120' depth, 3 incline shafts of 185', 290' and 325', and 8 tunnels, longest 225', showing an ore body averaging about 7% copper and 40% iron. The sulphide zone has not been reached, ores exposed being oxides, carbonate and silicates, none of the ores carrying important values in gold or silver. It is believed that a proper furnace mixture of ores can be secured from the mine, so that barren flux will not be necessary.

The mine, opened circa, 1864, was worked in a small way until 1874, and was again opened in 1884, when a 36" blast-furnace was erected. Property was taken over, 1902, by present company, and has been developed steadily, with a

small force, since then. The property has produced upwards of \$500,000 worth of high-grade ore, ranging from 15% to 40% in copper tenor, which was shipped by water to a port on the Gulf of California, presumably Guaymas, and trans-shipped thence to Swansea, Wales, for reduction. A little ore was sent to San Francisco also, and production is said to have given fair profits, notwithstanding the heavy expenses for freight and smelting, and the harassing difficulties caused by various Indian uprisings.

The property has been handicapped by distance from a railroad, but the Arizona & California railway line, now building west from Wickenburg, to the Colorado river, will pass within comparatively easy distance of the mine. The company plans sinking a new shaft of 500' depth, to reach the ore zone proven by the incline shaft, and to facilitate extraction, and also plans beginning smelting operations, during 1906, having accumulated about a year's supply of ore for the proposed smelter.

PLATA COBRE MINING & TRANSPORTATION CO.

ARIZONA.

Office: 415 Jackson Bldg., Denver, Colo. Mine office: Shultz, Pinal Co., Ariz. Wm. R. Benzie, president; John M. Shrote, secretary and treasurer; A. R. Benzie, superintendent. Lands include the Christmas Gift property, south of Casa Grande, bought September, 1903, ores of which carry silver, copper and gold. Idle and company apparently moribund.

PLATA COPPER MINING CO.

A swindle, promoted by the notorious Wm. F. Wernse gang, of St. Louis.

PLATTE CAÑON MINING CO.

WYOMING.

Mine office: Wheatland, Laramie Co., Wyo. Presumably idle.

PLENTY COPPER CO.

ARIZONA.

A swindle, promoted by the notorious Wm. F. Wernse gang, of St. Louis.

PLUMAS COPPER MINING & SMELTING CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Susanville, Cal.

PLUMAS MINING, MILLING & SMELTING CO.

CALIFORNIA.

Organized May, 1902, with capitalization \$200,000, by A. Dragovich, et al, of San Francisco, to build a smelter at Taylorsville, Plumas county, California, but unknown at Taylorsville. Presumably dead.

PLUTO GOLD & COPPER MINING CO.

WYOMING.

Office: 365 Tenth St., Oshkosh, Wis. Mine office: Dillon, Carbon Co., Wyo. Ole Granberg, president and general manager; H. Thorsgaard, vice-president; H. O. Granberg, secretary and treasurer; E. M. Sanders, superintendent; Frank Earle, engineer. Organized December 15, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued, \$909,735. Lands, 11 claims, patented, area 220 acres, also a 40-acre millsite, in the Battle Lake district, near the Ferris-Haggarty mine of the Penn-Wyoming Copper Co., showing 2 fissure veins in quartzite, and 2 contact veins between diorite and quartzite, ranging 2' to 30' in width, and carrying cuprite, melaconite and copper sulphides, associated with manganese, giving average assays of 1% copper and \$3 gold per ton, with a trace of silver, developed by numerous pits of 10' to 20' depth, 5 shafts of 55' to 100' depth, and by a tunnel of 1,004' with 2,000' of underground workings. Equipment includes a 40-h. p. steam plant

and a 3-drill air-compressor. Buildings are a 36x40' machine shop, 38x20' carpenter shop, and 6 other mine structures. Company plans continuing development.

PLYMOUTH ROCK MINE.

CALIFORNIA.

Mine office: Milton, Calaveras Co., Cal. T. T. Lane, owner. Ores carry gold, silver, lead and copper. Has water-power and a 10-stamp mill.

POCAHONTAS MINE.

CALIFORNIA.

Office and mine: care of Mrs. Abby Waller, owner, Merced, Mariposa Co., Cal. Lands, 160 acres, showing several veins of cupriferous iron ore, between dioritic walls, vein matter being mainly diabase and altered diabase. Principal vein is about 100' wide and the mineral belt is 1,000' wide in places. Ore bodies, in lenses, are said to carry 6% to 12% copper and \$2.50 gold per ton. Was a limited producer of high-grade carbonate and oxide ores, above the 100' level, ore below being sulphide. Idle for some years.

POCATELLO GOLD & COPPER MINING CO.

IDAHO.

Office and mine: Pocatello, Bannock Co., Idaho. E. Craanson, president; J. J. Guheen, secretary; N. M. Eldredge, general manager; Jos. E. Munn, superintendent. Organized Dec. 1, 1902, under laws of Idaho, with capitalization \$1,000,000, shares 50 cents par. Lands, 7 claims, area 140 acres, including the Moonlight claim, in the Fort Hall district, 12 miles east of Pocatello, showing a vein of about 3' average width, reported to give assays of 40% copper and 75% lead (total 115%) with 35 oz. silver and \$1 gold per ton, from bornite and chalcopryrite. This evidently is very rich ore, as veins carrying 115% in metallic values are unusual. From another source it is gathered that the ore is mainly of milling grade, with a small paystreak of smelting ore, from which small shipments to the White Knob smelter have given returns of 17% to 30% copper, and 15 oz. to 18 oz. silver per ton. Development is mainly by short tunnels, with circa 1,000' of workings.

MARTIN POE.

MEXICO.

Office and mine: Autlán, Jalisco, Mexico. Lands include sundry properties in the vicinity of Autlán, among these being the Quitlitlán, 20 miles east of Chamela, area 30 pertenenencias, showing a 30' vein of argentiferous copper and lead sulphides, associated with hematite, developed by a 50-meter shaft, formerly worked for silver, of which some ore was exported to Europe, now idle, on account of water. The Refugio y Anexas, 6 miles west of Agua Blanca, area 5 pertenenencias, show an 18' vein of auriferous copper ore, opened by 120 meters of tunnels, and formerly were worked for gold. La Cucusiapa, area 4 pertenenencias, shows a vein of 6' to 8' width, carrying argentiferous oxidized copper ores of \$20 to \$200 per ton value, opened by a shaft of 90 meters. La Anaconda, 6 miles east of Hacienda de Aguacopán, area 11 pertenenencias, shows a 15' vein carrying auriferous chalcopryrite, assaying 11% copper and \$5 gold per ton, opened by a 150' tunnel. The San José, 12 miles east of Autlán, area 40 pertenenencias, shows a 6' vein carrying auriferous and argentiferous copper ore, with some hematite, opened by a shallow shaft and short tunnel.

POGGIO GUARDIONE MINE.

ITALY.

Owned by Societa Delle Capanne Vecchie e Poggio Bindo.

POLAND EXTENSION GOLD MINING & MILLING CO.**ARIZONA.**

Office: 401 Henne Blk., Los Angeles, Cal. Mine office: Poland, Yavapai Co., Ariz. Chas. J. George, president; M. C. Nichols, secretary; John G. Gray, superintendent. Ores carry copper, lead and zinc. Has steam power.

POLARIS MINING & MILLING CO.**ARIZONA.**

Office and mine: Clifton, Graham Co., Ariz. Employs 60 men. J. B. Schmitz, president; J. Porter Bender, vice-president; A. S. J. Eyler, secretary; L. S. Sweeting, manager. Company is said to have placed a bond issue, variously estimated at \$750,000 to \$1,000,000, with Colorado Springs parties, and, as near as can be ascertained, the International Mining Co. has agreed to furnish \$75,000, in 3 years, for the development of the Polaris property.

Lands, 19 claims, lying northeast of the Clifton Consolidated and New England mines. Country rock is granite, with parallel intrusive porphyry dikes, showing contact veins carrying oxide, carbonate and altered sulphide ores, associated with gold-bearing quartz, with argillaceous gangue, lower workings showing auriferous and argentiferous chalcopryrite. Company is said to plan driving a 2-mile tunnel from a point near the San Francisco river, to cut the vein on the Polaris, at a depth of 2,000', near the apex of Mount Greenlee. Company is said also to plan constructing an electric third-rail tram-line, from the mine to Clifton, 7 miles, and to plan building a smelter at Evans Point, on the San Francisco river. Equipment includes steam and gasoline power, and a 20-stamp mill. Property is considered promising.

PONDILLAI & VOLCAN GROUP.**NEW CALEDONIA.**

Letter returned unclaimed from former mine office, Diahot, New Caledonia.

PONTIAC GOLD & COPPER MINING CO.**NEW MEXICO.**

Letter returned unclaimed from former mine office, Tres Piedras, N. M.

PONTIAC MINING CO.**VIRGINIA & NORTH CAROLINA.**

Office: 19 Liberty St., New York. Mine office: Virgilina, Halifax Co., Va. A. A. Sumner, president; Samuel Bryant, secretary; Robt. G. Lassiter, general manager. Organized 1902, under laws of New York, with capitalization \$1,600,000, shares \$10 par. Lands, 1,340 acres, in the Virgilina district of Virginia and North Carolina, carrying a fissure vein in schist, opened by the Tuck shaft of 125' and the Glasscock shaft of 203', showing cuprite, malachite and azurite to depth of 60', below which are chalcocite, bornite and chalcopryrite, with quartz and epidote gangue, giving average assays of 4% copper and 1 oz. to 2 oz. silver per ton, with traces of gold. Has gasoline power. Presumably idle.

POOLE GROUP.**ARIZONA.**

Letter returned unclaimed from former mine office, Washington, Santa Cruz Co., Ariz. Ores carry copper, gold, silver and lead.

POONA & MATTA DARRA MINES.**AUSTRALIA.**

Office: care of C. H. Hussey, Broken Hill Chambers, Adelaide, South Australia. Lands, 240 acres, adjoining the Moonta mine, on the Yorke Peninsula, South Australia. Has shafts of 120' and 228', showing rich ore in promising quantities. Presumably idle.

PORCUPINE MINE.**COLORADO.**

Office and mine: care of M. B. Sweeney, owner, Ashcroft, Colo.

PORCUPINE MOUNTAIN COPPER CO.**MICHIGAN.**

Office: Cleveland, Ohio. M. G. Watterson, president; E. S. Hough, secretary and treasurer. Was said to have been organized, 1901, under laws of New Jersey, with capitalization \$2,500,000, but returns from Mr. Watterson give the ownership as vested in a syndicate, promoted 1890, with 7 shareholders, title being held by trustees. Lands 1,100 acres, well timbered, including a portion of the old Carp Lake mine, in the Porcupine Mountains, Ontonagon county, Michigan, showing a continuation of the Keweenaw copper belt, with intercalated amygdaloidal traps and conglomerate tuffs, with sandstone, showing sundry beds carrying native copper, disseminated as speiss, through sandstone. Property has 2 ore bodies, of 27' estimated average width, with easterly and westerly strike and dip of 30° to the north, carrying estimated average values of 3% copper. Mine has circa 1,700' of underground workings, estimated to show 150,000 to 200,000 tons of stamp-rock.

PORTAGE LAKE & BISBEE MINING CO.**ARIZONA.**

Office: 12 First National Bank Bldg., Hancock, Mich. Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. W. S. Cleaves, president; John Funkey, vice-president; W. I. McMaster, secretary; Chas. Lewis, treasurer. Organized April, 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par, succeeding the Portage Lake & Calumet Development Co. Lands, 9 full and 3 fractional claims, area 191 acres, owned in fee and partly patented, 3 miles southeast of Bisbee, showing country rock of limestone, with a porphyry contact. Has a 302' shaft, with two compartments, each 4' 6" square and well timbered. Has a small air-compressor, Worthington sinking pump, 75-h. p. hoist, boarding-house, bunk-house and smithy. Extensive diamond drilling was done, 1903-1904, and considerable leached ore cut, the showing, while not including workable ore bodies, being of an encouraging nature. Property is idle, and company practically out of funds.

PORTAGE LAKE & CALUMET DEVELOPMENT CO.**ARIZONA.**

Reorganized, April, 1903, as Portage Lake & Bisbee Mining Co.

PORTLAND COPPER CO.**WASHINGTON.**

Mine office: Berlin, King Co., Wash. Lands, sundry claims, 5 miles from Berlin and a railroad, showing a 17' vein, with east and west strike, carrying native copper, bornite and chalcopyrite, opened by tunnels of 40' and 75'.

PORTLAND COPPER MINING CO.**WYOMING.**

Succeeded by Battle Copper Mining Co.

PORTLAND GOLD & COPPER MINING CO.**WASHINGTON.**

Office: 7-127½ First St., Portland, Ore. Harvey Bailey, president and general manager; Conrad Wyss, vice-president; H. W. Bailey, secretary and treasurer; A. B. Burgoyne, general superintendent; preceding officers and Dr. R. D. Wiswall, directors. Organized under laws of Washington, with capitalization \$1,250,000, shares \$1 par. Lands, 17 claims, area 340 acres, well

timbered, on the north fork of the Toutle river, in the Mount St. Helens district of Skamania county, Washington, having circa 500' of workings, showing ore giving good assay values in gold and copper.

PORTLAND-IMNAHA COPPER MINING CO.

Disincorporated, September, 1902, with all debts paid.

PORTLAND MINE.

WYOMING.

Owned by Battle Copper Mining Co.

PORTLAND MINING CO.

BRITISH COLUMBIA.

Office: 19 North Seventh St., Terre Haute, Ind. Mine office: Aspen Grove, Yale district, B. C. Andrew J. Crawford, president; M. T. Hidden, secretary; J. E. Bates, general manager. Organized 1901, under laws of British Columbia, with capitalization \$15,000, shares 1 cent par. Lands, 4 patented claims, area 204 acres, also 160 acres miscellaneous lands, in the Aspen Grove district, showing 10 veins, of which 2, under development, give assays of 15% copper, 3 oz. silver and 80 cents gold per ton, from carbonate and sulphide ores, opened by a 155' shaft and 32' tunnel. Is said to show a considerable body of low-grade ore, worth \$5 to \$6 per ton. Idle, until rail connections can be secured.

PORTLAND (ROSSLAND) MINE, LTD.

BRITISH COLUMBIA.

Merged, 1904, in Velvet-Portland Mine, Ltd.

PORVENIR DE SONORA CO.

MEXICO.

Reorganized, 1902, as Coast Line Copper Co.

POSTAL GOLD, PLATINUM & COPPER MINING CO.

WYOMING.

Moribund. Fully described in Vols. IV and V.

COMPAÑIA MINERA POTOSINA.

MEXICO.

Office: Apartado 68, San Luis Potosí, S. L. P., Mex. Letter returned unclaimed from former mine office, Charcas, S. L. P., Mex. Property was the Guadalupe y Anexas mines.

MINA EL POTRILLO.

MEXICO.

Mine office: Indé, Durango, Mexico. Victoriano Mantos, owner. Ores carry copper and silver. Has steam power.

NEGOCIACION MINERA DE POZOS.

MEXICO.

Mine office: Pozos, Guanajuato, Mex. Operates Santa Brigida y Anexas, Santa Lucia and La Argentina mines, producing gold, silver and copper, latter as a by-product. Has steam power and employed several hundred men, at last accounts.

PRATT PYRITES MINES.

GEORGIA.

Mine office: Dahlonega, Lumpkin Co., Ga. Ores are cupriferous and auriferous iron pyrites, carrying up to 2% copper and \$2 gold per ton.

PRESIDENTIAL MINING CO.

ARIZONA.

Mine office: Patagonia, Santa Cruz Co., Ariz. Ores carry silver, lead and copper. Presumably idle.

PRESTON PEAK COPPER CO.

CALIFORNIA.

Presumably dead. Letters returned unclaimed from all offices. Described in Vol. V.

PRIDE MINING CO.**COLORADO.**

Dead. Formerly operated at Montezuma, Summit county, Colorado.

PRIDE OF ARIZONA COPPER CO.**ARIZONA.**

Dead. A Douglas-Lacey promotion—which is equivalent to terming it a swindle. Promoters, on January 30, 1904, reported property abandoned, but company's name still appears in New York and St. Louis city directories. For description of methods of Douglas, Lacey & Co., see Amalgamated Gold & Copper Co.

PRIDE OF THE WEST MINING & MILLING CO.**ARIZONA.**

Office: 1801 Fifteenth St., Denver Colo. Letter returned unclaimed from former mine office, Washington, Santa Cruz Co., Ariz. Arthur R. Wilfley, president; Herbert E. Fiske, secretary. Organized May 1, 1901, under laws of Colorado, with capitalization \$1,500,000, shares \$10 par. Paid one dividend, of \$15,000. Lands, circa 350 acres. Mine was opened 1870, reopened 1897, closed 1902, since idle. Main shaft, about 300'. Cres carry silver, copper, lead and zinc. Has a 200-ton concentrator. Fully described in Volumes II and III.

PRINCE MINING & DEVELOPMENT CO., LTD.**BRITISH COLUMBIA.**

Office: Revelstoke, B. C. Mine office: Standard Basin, Big Bend division, West Kootenay district, B. C. W. M. Brown, chairman; J. M. Scott, secretary and general manager; C. J. Rumens, superintendent; preceding officers, Jerry Culbertson and Dr. S. A. Delameter, directors. Organized 1900, under laws of British Columbia, with capitalization \$1,000,000, shares \$1 par; issued, \$770,000. Annual meeting, second Wednesday in March.

Lands, 20 claims, area 800 acres, known as the Standard group, also a 480-acre millsite and 640 acres timber lands, giving total holdings of 1,920 acres, in the Revelstoke district. Country rocks are banded schist and diorite, carrying chalcopyrite and bornite, in a vein of 20' width, with gangue of serpentine and argillaceous schist, ore being estimated to carry average values of 6% copper, 2 oz. silver and \$2 gold per ton. Development is by tunnels of 40', 110', 480', 600', 275', and 720', with circa 3,000' of underground workings, estimated to show 150,000 tons of ore, with 100,000 tons blocked out for stoping. A good water power is available for mining and milling purposes. The property has not reached yet the producing stage, and needs a tram-line and mill, but gives promise of making a good mine.

PRINCESS ADA MINE.**WASHINGTON.**

Office and mine: Marcus, Stevens Co., Wash. Chas. H. Alban, owner.

PRINCESS ROYAL GOLD & COPPER MINING CO.**BRITISH COLUMBIA.**

Office: New Whatcom, Wash. Henry W. Parrot, president; Samuel D. Slentz, secretary. Lands, sundry claims, on Princess Royal Island, ores from which have given assays very high in copper, with \$4 to \$10 gold per ton. Idle.

PRINCESS ROYAL GROUP.**BRITISH COLUMBIA.**

Office: care of Capt. John Irving, Victoria, B. C. Lands, 120 acres, showing a 4' vein with 18" to 24" paystreak carrying auriferous and argentiferous copper ores that have returned smelter values up to \$120 per ton. Idle.

PRINCETON COPPER MINING & SMELTING CO.**ARIZONA.**

Office: 171 Broadway, New York. Mine office: Ft. Huachuca, Cochise Co., Ariz. Henry Hamburg, president and general manager; Jas. W. Herale, vice-president; Wm. T. Huguley, secretary and treasurer; preceding officers, J. M. O'Connell and L. de Vere Hamburg, directors. Organized 1901, under laws of South Dakota, with capitalization \$2,500,000, shares \$1 par. Lands, 8 claims, well timbered, in Ramsey Cañon, Hartford district, Huachuca Mountains, opened by 4 shafts, deepest 80', and by tunnels of 60', 70', 115' and 250', with a quarter-mile of underground workings, showing malachite, chalcocite and bornite, giving assays of 10% and upwards in copper, 10 oz. to 50 oz. silver, and small gold values. Property was opened, circa 1880, by Ben Williams. Work was discontinued June, 1905, and property was idle at last accounts. Financial affairs were in a tangle, October, 1905, but are said to have been straightened out.

PRODIGAL SON MINE.**CALIFORNIA.**

Letter returned unclaimed from former mine office, Cayucos, San Luis Obispo Co., Cal. Has limited development by shaft and tunnel, showing a vein of about 7', traversing syenite and serpentine and carrying auriferous and argentiferous chalcocite, with quartz gangue.

PRODUCER GOLD & COPPER MINING & MILLING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Capitalization \$3,000,000, shares \$1 par. Lands, 12 claims, on Copper Mountain, slightly developed. Equipment includes an air-compressor and a mill with 10 gravity stamps.

PRODUCER MINING & SMELTING CO.**ARIZONA.**

Office: 510-125 La Salle St., Chicago, Ills. Mine office: Casa Grande, Pinal Co., Ariz. J. W. McCoy, president; E. R. Zimmerman, secretary. Lands were the Jack Rabbit group of 80 acres, in Pinal county, the Producer and Century-Chief group of 320 acres and the Index group of 220 acres in Pima county, Arizona. Lands, in the Quijotoa Mountains, were held under \$30,000 bond and lease, on which \$14,000 was paid before company learned that vendors lacked proper title. Main shaft, 200', with about $\frac{1}{2}$ mile of underground openings, is said to show 52,000 tons of auriferous and argentiferous copper ore. Presumably idle.

MINA LA PROFUNDA.**SPAIN.**

Mine office: care of Don Ruperto Sanz, León, León, Spain. Lands include La Profunda, Cármenes and one other mine, which were working, on a small scale, at last accounts.

MINA EL PROGRESO.**MEXICO.**

Mine office: care of A. E. Turner, owner, Sabinal, Chihuahua, Mex. Ores carry silver, copper and lead. Has steam power.

MINA PROMONTORIO.**MEXICO.**

A copper-gold property, northwest of the city of Durango, Durango, Mexico, said to be owned by an Anglo-German company, and said to have large ore bodies. Erected a 100-ton concentrator and small matting furnace, circa 1902. Presumably idle.

PROMONTORIO CONSOLIDATED MINING CO.**MEXICO.**

Office: Nogales, Ariz. Leopold Ephraim, president; R. D. George, secretary. Lands are circa 30 miles south of Nogales, in the Arizpe district of Sonora, Mexico. Ores are lead and copper sulphides, with gold and silver values. Was worked for about 12 years, by Mr. Ephraim, before formation of present company, high-grade ores being shipped to El Paso smelters and low-grade ores accumulated on dumps. Later developments have not come up to expectations.

PROMONTORIO MINING & SMELTING CO.**MEXICO.**

Dead. Property, near Lampasos, Moctezuma, Sonora, Mexico, now held by Travers-Durkee Coppers.

PRO PATRIA MINING & MILLING CO.**COLORADO.**

Mine office: Rico, Dolores Co., Colo. W. J. Scoutt, superintendent. Ores carry gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator.

PROSPER GOLD MINING CO.**NEW MEXICO.**

Mine office: Hillsboro, Sierra Co., N. M. Ores carry gold, silver and copper. Has steam power. Presumably idle.

MINA PROTECTARO.**MEXICO.**

Office and mine: care of F. B. Najara y Ca., owners, Topia, Durango, Mex. Ores carry gold, silver and copper. Employed circa 50 men, at last accounts.

PROVIDENCE GOLD & COPPER CO.**CALIFORNIA.**

Office: 617 Homer Laughlin Bldg., Los Angeles, Cal. Mine office: Goldstone Camp, via Kelso, San Bernardino Co., Cal. Employs 8 men. P. H. Mathews, president; W. E. Baxter, vice-president; F. H. Messmore, auditor; A. Samuel Parks, secretary; preceding officers, C. M. Wood and Jas. H. Dewey, directors; C. J. Callahan, consulting engineer. Organized November 2, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par; issued, \$1,776,789. Pays current accounts monthly, and is without debt. Annual meeting, first Monday in November.

Lands, 15 claims and 8 millsites, area 340 acres, patents applied for, in the unorganized Arrow district, showing 15 fissure veins, carrying sulphide ores, assaying circa 1% copper and \$4 to \$1,000 gold per ton, with small silver values. Has several shafts, all under 100', with a total of 2,100' of underground openings. Will continue development work during 1906. Management is good and property considered promising.

PROVIDENCE GOLD, SILVER & COPPER MINING CO.**ARIZONA.**

Was organized by the joint efforts of Fanny Pogue, a colored woman of Tucson, Arizona, Walter M. Roberts, of St. Louis, and others. Is a twin of the United Copper Mining Co., and apparently claims some ground that already is claimed by several sets of Lincoln mining companies. In this case it might not be wise to put too much trust in Providence.

MINA LA PROVIDENCIA.**MEXICO.**

Mine office: Gavilanes, Durango, Mex. Anastasio Lugo, owner and manager. Has a 130' main shaft, developing argentiferous copper ores. Has water power, and employed circa 40 men, at last accounts.

PROVIDENCIA MINES CO.**MEXICO.**

Mine office: Cosalá, Sinaloa, Mexico. E. A. Stent, manager. Organized circa 1906, with capitalization \$500,000, to operate the Campanillas mines.

PROVIDENCE MINING CO., LTD.**BRITISH COLUMBIA.**

Office: care of J. B. Heeny, secretary and treasurer, Chicago, Ills. Mine office: Greenwood, Yale District, B. C. M. S. Madden, president; D. B. Scully, vice-president P. J. Dermody, superintendent. Mine carries principally gold values. Statement, at last annual meeting, showed a balance of cash assets of \$42,290.24, and a profit, on 1905 operations, of \$19,034.76. A quarrel between the Chicago and local interests resulted in some litigation, in which the Chicago men were successful.

PRUDENTIAL COPPER MINING CO.**ARIZONA.**

Office: care of Shea Smith, president, 18 Custom House Pl., Chicago, Ills. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. E. A. Haggott, consulting engineer. Idle.

PRUDENTIAL MINING CO.**CALIFORNIA.**

Office: care of H. S. Reed, manager, Medford, Ore. Lands, near Shelly Creek, Del Norte county, California, are slightly developed by shaft and tunnel, showing 2 veins of 25' to 30' width. Ore is pyrrhotite, carrying copper, gold, silver and zinc, in small percentages. Idle at last accounts.

PRUDENTIAL MINING & DEVELOPMENT CO.**ARIZONA.**

Letters returned unclaimed from former mine office, Nogales, Santa Cruz Co., Ariz. Lands were 12 claims, adjoining the Buena Vista group of the Black Mountain Mining Co.

PSYCHE MINING CO.**OREGON.**

Office: Omaha, Neb. Mine office: Greenhorn, Baker Co., Ore. J. Fawcett, manager. Ores carry gold, silver and copper. Has steam power and a 20-stamp mill.

PTARMIGAN GROUP.**BRITISH COLUMBIA.**

Sundry claims at the head of McDonald creek, an affluent of Horse Thief creek, East Kootenay, British Columbia, showing slightly auriferous and highly argentiferous copper ores, claimed to be opened by about 3,000' of tunnels and drifts.

PUERTECITO COPPER CO.**MEXICO.**

Succeeded the Sonora Copper Co. Assets consist of a lawsuit against Col. Wm. C. Greene.

PUGET SOUND COPPER MINES.**BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Has a copper ore body, with heavy gossan capping of fair-grade iron ore. Presumably idle.

PUGET SOUND INVESTMENT CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Irondale, Wash. Had copper claims near Gillies Bay, Texada Island, British Columbia.

PUGET SOUND REDUCTION CO.**WASHINGTON.**

Control passed, 1905, to American Smelters Securities Co.

PUGWASH CONSOLIDATED MINING & SMELTING CO.**NOVA SCOTIA.**

Letter returned unclaimed from former office, 50 Congress St., Boston,

Mass. H. H. Mansfield, treasurer. Company succeeded the Pugwash River Copper Co., which held 320 acres of land on the upper Pugwash river, Cumberland county, Nova Scotia. Property is said to show chalcocite in sandstone. Idle.

PUGWASH RIVER COPPER CO.

NOVA SCOTIA.

Succeeded, circa 1904, by Pugwash Consolidated Mining & Smelting Co.

PULIDO MINING CO., LTD.

PORTUGAL.

Offices: 5, Great Winchester St., London, E. C., Eng. J. Silva, chairman; C. E. Wilkey, secretary. Capitalization, £165,000. Lands, 22 mineral concessions, in the Beja district, province of Alemtejo, Portugal. Moribund. **COMPANIA DE MINAS Y FUNDICION DE PUQUIOS.**

CHILE.

Mine office: Los Puquios, Rancagua, Chile. Operates the Santa Rita, Ricardita, Morada and Magdalena mines, opened 1897, upon a considerable scale. Has steam power and a smelter, employing several hundred men.

PURITAN COPPER & GOLD MINING CO.

NEW MEXICO.

A swindle, promoted by Benj. F. Coburn, of Boston, who "guaranteed" 10% dividends for 5 years.

PYNE SMELTING CO.

CALIFORNIA.

Office: 26 First National Bank Bldg., San Francisco, Cal. Works office: West Alameda, Alameda Co., Cal. P. W. Pyne, manager. Works have a daily capacity of 100 tons. Idle since 1903, having been closed by courts, on complaints of gardeners in vicinity that fumes injured vegetation.

PYRAMID COPPER CO.

Organized, 1902, under laws of Maine, with capitalization \$500,000, with \$300 paid in. Presumably dead.

PYRAMID COPPER SYNDICATE, LTD.

BRITISH COLUMBIA.

Dissolved, August, 1905.

PYRAMID GOLD & COPPER MINING CO.

ARIZONA.

Moribund. W. H. Ruffhead, the president, says that every last one of his associates was a shark. Mr. Ruffhead is accused, in turn, of having become involved in illegal transactions, to the company's undoing. Fully described in Vol. V.

PYRAMID PEAK MINING CO.

NEW MEXICO.

Mine office: Lordsburg, Grant Co., N. M. Company held the Nellie Bly claim, under a \$25,000 option, but surrendered same December, 1905, and apparently has lost its life, as well as its property.

PYRENEES COPPER MINES, LTD.

FRANCE.

Dissolved, August, 1904.

PYRENEES MINERALS, LTD.

FRANCE.

Offices: 60, King St., Manchester, Eng. W. Dearden, secretary; Isidore Tom, mine manager. Organized May 5, 1902, with capitalization £160,000, shares £1 par; issued, £98,207. Debentures, £60,000, at 6%. Lands, 1,818 acres, including the Alzen silver and copper mines, in the department of Ariège, France. Has a 20-ton smelter. Idle and presumably moribund.

PYRITE KING COPPER MINING CO.

SOUTH DAKOTA.

Office: Pipestone, Minn. Lands are in the Black Hills, South Dakota. Idle.

PYTHON GROUP.

Mine office: Kamloops, Yale district, B. C. Idle.

"Q" COPPER SYNDICATE, LTD.

Offices: Worcester House, Walbrook, London, E. C., Eng. Organized Nov. 29, 1905, with capitalization £10,000, in 5,000 preference £1 shares and 50,000 ordinary 2s. shares.

Q. S. GOLD MINING & SMELTING CO.**WASHINGTON.**

Office: 640 Hyde Blk., Spokane, Wash. Mine office: Camp Q. S., via Conconully, Okanogan Co., Wash. Employs 6 men. A. M. Dewey, president and general manager; F. S. Beavis, vice-president; F. S. Merrill, secretary; Samuel Crow, treasurer; F. Moritz, superintendent; L. K. Armstrong, consulting engineer. Organized 1897, under laws of Washington, with capitalization \$2,000,000, shares \$1 par.

Lands, 18 claims, area 360 acres, also 600 acres in millsites, in the Salmon district. Country rock is mainly diorite, carrying several fissure veins, of which one, developed by a 120' tunnel, is of 150' estimated width, traceable 4,500' on surface, carrying chalcopryite of uncertain grade, estimated at better than 2% copper, with small and variable silver values and \$1 and upwards gold per ton. The tunnel is expected to crosscut the vein at a further distance of about 300', giving a 600' back.

QUARTETTE MINING CO.**NEVADA.**

Office: 1016 Old South Bldg., Boston, Mass. Mine office: Searchlight, Lincoln Co., Nev. Geo. G. Crocker, president; Andrew N. Creston, vice-president; Chas. A. Hopkins, treasurer; Geo. B. Drake, secretary; F. B. Harrington, superintendent; James Luxton, mine superintendent; Paul Johnson, mill superintendent. Property is primarily a largely productive gold mine, carrying a little copper ore, said in the press to have \$9,000,000 worth of free milling gold ore blocked out. Has steam and gasoline power, 35-stamp mill and 100-ton cyanide plant, employing 75 to 100 men, and pays 6% dividends.

QUEBEC COPPER CO., LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Deadwood, B. C.

LA QUEBRADA GROUP.**VENZUELA.**

Includes the principal mines of the Quebrada or Aroa district of Venezuela, which have produced about 60,000 tons of fine copper. Group includes the Cumuragua mine, having a vein of carbonate ore 1' to 5' wide; the Titiana mine, with vein 2' to 25' wide; the San Antonio mine, with vein of 3' to 18', and the Quebrada mine, with a vein 50' to 75' wide, 2,000' long and of unknown depth, from which oxide and carbonate ore have been mined in the alteration zone, leaving a large body of sulphide ore, averaging possibly 5% to 6% copper, in the lower workings. This group is one of great importance, but owing to the extremely unsettled political conditions in Venezuela, capital cannot be induced to consider the reopening of the mines.

QUEEN BEE COPPER MINING CO.

Letter returned unclaimed from former office, 220 Broadway, New York.

QUEEN BEE MINE.**ARIZONA.**

Mine office: Kingman, Mohave Co., Ariz. Lands include the White Copper mine. Presumably idle.

QUEEN BEE MINING CO.**AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. At last accounts was developing claims in the Bee Mountains, 11 miles southeast of Cobar, said to show a 50' vein, giving assays up to 45 % copper, with fair gold and silver values.

QUEEN MINING & MILLING CO.**NEW MEXICO.**

Office: care of H. A. Griffin, secretary, Galveston, Texas. Mine office: Cooney, Socorro Co., N. M. Organized under laws of Texas. Lands, 5 claims, known as the Copper Queen group, showing good bodies of low grade gold-silver-copper ores, developed by about 3,000' of underground workings. Has steam power and a 15-stamp pan-amalgamation mill.

QUEEN OF ARIZONA COPPER CO.**ARIZONA.**

Merged, 1902, in Great Belcher-Bullwhacker Gold Mining Co.

QUEEN OF THE WEST MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. L. C. Moe, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

QUEENSLAND COPPER CO., LTD.**AUSTRALIA.**

Offices: 6, Princes St., London, E. C., Eng. Mine office: Mt. Perry, Bowen Co., Queensland, Australia. Geo. Grinnell-Milne, chairman; J. D. Audley Smith, mine manager; Sydney H. Pulbrook, superintendent; J. S. MacArthur, consulting engineer; J. G. Tait, secretary. Organized Feb. 1, 1898, with capitalization £500,000, shares £1 par, in £250,000 cumulative 6% preference shares and £250,000 ordinary shares. After payment of 6% on ordinary shares in any year, remaining profits are divisible equally between preference and ordinary shares. Last dividend on ordinary shares was 6%, in 1903. For fiscal year 1905, profit was £12,756 2s. 11d.

Lands include the Mount Perry, Reed's Creek, Great Freehold and New Moonta mines, and the Normanby mine, held under a two years' option expiring June, 1907, in the vicinity of Mt. Perry, in the Herberton district. The three principal mines of the company have 15 shafts, of 120' to 800' depth. The company also works various mines in the Wolca and Boolboonda districts.

The Mt. Perry mine has sundry fissure veins traversing granite, the main vein, of about 12' average width, having a paystreak of 6" to 8" width in the upper levels and 10" width in the lower levels, carrying an average of circa 16% copper. The mine is opened by 3 old shafts, poorly located and inadequate. The management plans sinking a new main working shaft, between Kennedy's shaft and the South shaft, which would cut the vein at a depth of circa 1,000'. The ground has grown harder with depth, and the extra cost of operating deep workings renders a new and modern shaft necessary.

The Great Freehold mine, area 811 acres, has a nearly vertical fissure vein in granite, averaging 5' width, with an 18" paystreak, carrying, chal-

copyrite averaging circa 14% copper, with fair gold and silver values, developed by a 200' main shaft.

The Reed's Creek mine has a fissure vein in granite, similar to that of the Mt. Perry, and is extensively developed, but the shafts are small and poorly located for modern mining requirements. Combined area of the Mt. Perry and Reed's Creek mines is 650 acres, freehold.

The New Moonta is a comparatively new mine, much similar to those previously described, from which about 2,000 tons of high-grade ore were mined in 1905, and is considered a promising property, recent developments having given promise of the mine holding good values to depth.

The Normanby mine, held under option, is 240 acres, freehold, on the other side of the mountain from the Mt. Perry mine, with a vein paralleling the same, and of a similar nature. This property produces ore averaging circa 13% copper and 10 dwts. to 15 dwts. gold per ton.

In addition to the mines of the Mt. Perry district, the company works the Greenback, Potosi and Wolca mines, in the Wolca district, northeast of Mt. Perry, and the Edena and Boolboonda mines, in the Boolboonda district, northeast of the Wolca district. The veins of these latter properties are narrow, but persistent, and carry high-grade auriferous and argentiferous copper ores.

The smelter, at Mt. Perry, built 1902, has one 40-ton and one 90-ton water-jacket blast-furnace, and it is planned to install a converter plant. The smelter is connected with the principal mines by a tram-line, and also does custom smelting. The smelter is rated, by the company, at only 50 tons daily capacity.

For the fiscal year 1905, the furnace smelted 10,388 long tons of ore, about 25% of which was custom ore, producing therefrom 2,952,320 lbs. fine copper, 74,395 oz. silver and 2,055 oz. gold. The property has proven somewhat disappointing, possibly because the hopes originally entertained were based upon an imperfect understanding of the circumstances, but the outlook seems better, and with a maintenance of high copper prices for another year or two, and the opening of new shafts, the property should get upon its feet.

QUEENSLAND MINES EXPLORATION CO.

AUSTRALIA.

Dead. Very dead. Samuel Phillips says, dead as Mahomet's black dog.

QUEENSLAND PIONEERS, LTD.

AUSTRALIA.

Voluntarily liquidated, February, 1902.

QUEENSLAND SMELTING CO., LTD.

AUSTRALIA.

Offices: Dashwood House, London, E. C., Eng. Works office: Aldershot, Maryborough, Queensland, Australia. Chas. Poston, chairman; Arthur Kift, secretary and managing director. Organized Jan. 3, 1899, as reconstruction of a company of same name organized 1888, with capitalization £50,000, in £30,000 cumulative 5% preference shares and £20,000 ordinary shares; issued, £38,630. Debentures, £65,000 authorized, £43,800 issued, in £100 bonds, at 5%. Paid a 5% dividend, on pref-

erence shares, 1903. Property is 1,168 acres, freehold, with a smelting plant having furnaces for reduction of copper, gold, silver and lead ores.

QUEEN VICTORIA MINE.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Beasley Camp, via Nelson, Kootenay district, B. C. Has a big bluff of copper ore, claimed to be 300' wide and 400' long, with rhyolite walls, slightly developed. Idle for several years.

QUICKSILVER MINES, (CALIFORNIA, U. S. A.) LTD.

CALIFORNIA & OREGON.

Dissolved, August, 1904.

COMPANIA EXPLOTADORA DE LA MINA DE COBRE QUILILLA.

MEXICO.

Office: Scranton, Pa. Mine office: Ameca, Jalisco, Mex. Chas. S. Weston, president; John W. Fowler, secretary and treasurer; Independence Grove, general manager; Felix Orozco, superintendent. Lands, 50 pertenencias, area 123 acres, in the Ameca district of Guachinango, showing 2 fissure veins in porphyry, of which one, averaging 4' to 6' width, is opened by 5 shafts, of 40' to 190' depth, and by 5 tunnels, longest 460', with about 1,500' of underground workings. Ores give average assays of about 9% copper, 10 oz. to 25 oz. silver and \$3 gold per ton.

QUINCY & ARIZONA DEVELOPMENT CO.

ARIZONA.

Office: care of N. A. Metz, secretary and treasurer, Hancock, Mich. Letter returned unclaimed from former mine office, Bisbee, Cochise Co., Ariz. J. J. Beatty, president; Geo. Keller, superintendent. Capitalization \$600,000, shares \$10 par. Lands, 12 claims, adjoining the Portage Lake & Bisbee. Idle and presumably moribund.

QUINCY MINING CO.

MICHIGAN.

Office: 32 Broadway, New York. Mine and works office: Hancock, Houghton Co., Mich. Employs 1,704 men. Wm. R. Todd, president; Walter P. Bliss, vice-president; preceding officers, Cleveland H. Dodge, James L. Bishop, Chas. J. Devereaux, Isaac H. Meserve, Daniel T. Brigham and Hon. Don M. Dickinson, directors; W. A. O. Paul, secretary and treasurer; Chas. L. Lawton, superintendent; Jas. W. Shields, mill superintendent; Will P. Smith, smelter superintendent; Thos. Whittle, mining captain; Chas. K. Hitchcock, Jr., engineer; F. J. McLain, mine clerk; Wm. Bath, smelter clerk; Walter Bloomfield, purchasing agent; Wm. Gilliland, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,500,000.00
Amount paid in by conveyance of property.....	1,000,000.00
Amount of personal estate.....	966,474.41
Amount of floating debt.....	286,951.40
Amount due company.....	267,318.30

The following table shows statistics of production, costs, etc., since 1864:

Year.	Product. Pounds.	Yield fine copper per fathom broken. Pounds.	Price obtained. Cents.	Cost per pound exclu- sive of con- struction. Cents.	Number of miners.	Average monthly contract wages.
1864.....	2,498,574	562	44.8	26.7	242	\$65.50
1865.....	2,720,980	501	....	....	212	57.53
1866.....	2,114,220	451	31.3	29.0	227	53.16
1867.....	1,921,620	526	22.7	18.9	167	50.83
1868.....	1,417,941	447	25.2	23.1	157	50.44
1869.....	2,417,365	446	21.9	16.7	210	51.10
1870.....	2,496,774	528	21.5	15.3	181	46.09
1871.....	2,409,501	441	22.8	15.2	104	47.08
1872.....	2,269,104	391	32.5	22.9	233	60.62
1873.....	2,621,087	491	26.5	18.6	223	62.40
1874.....	3,050,154	577	21.9	15.1	234	43.38
1875.....	2,798,281	485	22.7	15.8	217	46.74
1876.....	3,073,171	507	20.0	15.7	227	47.13
1877.....	2,837,014	467	18.6	15.1	247	43.79
1878.....	2,991,050	395	14.9	14.0	234	41.50
1879.....	2,639,958	403	16.3	13.7	212	38.76
1880.....	3,609,250	563	18.5	11.8	192	49.10
1881.....	5,702,606	766	18.7	10.6	212	48.54
1882.....	5,682,663	800	17.1	9.5	152	48.83
1883.....	6,012,239	850	13.7	8.9	165	46.02
1884.....	5,680,087	722	12.2	8.6	157	43.35
1885.....	5,848,497	710	11.4	7.5	132	44.00
1886.....	5,888,517	638	11.1	6.8	140	45.80
1887.....	5,603,691	781	11.7	8.6	142	48.40
1888.....	6,367,809	690	15.9	10.1	158	49.60
1889.....	6,405,686	690	12.0	9.4	145	49.15
1890.....	8,064,253	769	15.7	8.2	146	52.60
1891.....	10,542,519	685	12.8	9.1	182	53.40
1892.....	11,103,926	572	11.2	8.8	238	53.75
1893.....	14,398,477	574	10.4	7.1	259	49.60
1894.....	15,484,014	584	9.5	5.7	285	50.70
1895.....	16,304,721	517	10.1	5.9	336	50.00
1896.....	16,863,477	477	10.9	6.5	379	52.00
1897.....	16,924,618	481	11.1	6.8	393	52.52
1898.....	16,354,061	513	12.0	6.8	381	52.50
1899.....	14,301,182	427	17.0	8.1	401	56.72
1900.....	14,116,551	391	16.6	9.3	433	62.00
1901.....	20,540,720	409	16.1	8.8	533	62.00
1902.....	18,988,491	347	11.9	9.0	562	62.00
1903.....	18,498,288	325	13.2	9.7	586	62.00
1904.....	18,343,160	307	13.3	9.7	592	62.40
1905.....	18,827,557	277	15.8	10.1	643	65.10

Organized 1848, under special charter from the state of Michigan, and re-incorporated, March 6, 1878, for a term of 30 years, expiring 1908, under the general mining laws of Michigan, with capitalization \$1,250,000, increased, Apr. 16, 1897, to \$3,750,000, shares \$25 par. Old Colony Trust Co., Boston, transfer agent. Dividends, paid semi-annually, were \$500,000 in 1904 and \$600,000 in 1905, while the semi-annual dividend of February, 1906, was \$500,000. First dividend was paid 1862, and profits have been disbursed to shareholders in each succeeding year, excepting only 1866 and 1867, rendering the Quincy the oldest dividend-paying Lake Superior copper mine, the oldest American dividend-payer among copper mines, one of the oldest dividend-paying copper mining companies of the world, and one of the very few American mining companies, of any sort, that have an unbroken dividend record for the past 40 years. Dividend disbursements, to the close of 1905, were \$15,570,000.

The following table compares figures of production, income, costs and dividends, for the years 1901 to 1905:

	1901	1903	1904	1905
Mineral, pounds,.....	27,778,268	25,220,220	27,171,238	29,423,448
Copper, pounds,.....	20,540,720	18,498,288	18,343,160	18,827,557
Gross receipts,.....	\$3,327,071	\$2,447,351	\$2,472,379	\$2,981,120
Expenditures at mine...	1,601,535	1,573,863	1,594,711	1,715,419
Construction account....	167,192	117,775	106,002	138,732
Smelting and misc.....	206,303	234,590	194,111	139,097
Net mining profit,.....	1,352,039	521,122	655,926	1,075,197
Other income,.....	72,503	17,804	27,630	29,285
Total net profit,.....	1,424,542	538,926	577,554	965,750
Dividends,.....	900,000	550,000	500,000	600,000
Balances,.....	+524,542	-11,074	+77,554	+365,750

The deficit shown in the preceding table was the difference between net earnings and dividend payments, and came from the surplus.

The mine is opened on the Pewabic amygdaloid, which has an average dip of 52° to 54° at surface, and a dip of approximately 37° 30' at a depth of -5,000', in the lowest workings, the shafts following the pitch of the lode on catenary curves. The average width of the lode is about 20' in the upper workings, but is materially narrower at the bottom, and copper values also are less, the rock showing very little heavy copper in the lower stopes, but being more uniform in values than above. The lode has an extreme width of 40', at several points, and is only 10' to 15' wide in No. 8, the northernmost shaft. About 40% of the production was heavy copper, some 20 years ago, but this decreased to 9%, in 1905. In the upper levels immense masses of native copper were found frequently, these ranging up to 300 tons in weight. Practically the entire lode is now mined, from wall to wall. The southernmost drifts in the Quincy are under the village of Hancock, and nearly 3,000' below the mean water-level of Portage Lake, while the northernmost workings, in the Mesnard shaft, are about 8,000' from the southern headings, with about a mile of the lode untouched on the Mes-

nard and Pontiac tracts north of No. 8 shaft. The walls are strong and need little timbering, dry walls being built of waste rock in wide stopes, saving the cost of hoisting worthless rock and the expense of extra timbering. Fire-doors have been installed, and every precaution is taken against fire. Miners are carried to and from their work in man-cars holding 30 men, and hoisting cables are inspected frequently, and every care taken to prevent accidents. Shafts are sunk mainly in the footwall, obviating the necessity of leaving large quantities of payable stamp-rock standing in pillars.

The principal workings of the Quincy are on the Pewabic lode, whence have come the millions in dividends paid by the mine, but the property has several other parallel cupriferous amygdaloidal beds, and was opened originally, in 1848, on the Quincy amygdaloid, a parallel bed lying some distance west of the Pewabic, which was abandoned when the Pewabic lode was opened, in 1856. There also is a footwall branch, known as the Pewabic East Lode, underlying and paralleling the main bed, which yields good returns occasionally. The so-called West Lode, 300' west of the Pewabic, has been opened from shafts 4 and 7 by crosscuts from the 36th, 39th, 40th, 44th and 49th levels. About 150' west of the West lode is another amygdaloid, averaging 40' width and carrying more or less copper, which possibly may prove workable. About 1,000' west of the Pewabic is the Hancock amygdaloid, which was narrow but fairly mineralized, where worked in the old Hancock mine, yielding an average of 21 lbs. fine copper, per ton of rock stamped, which is above the present average of the Quincy.

Electric underground traction is in extensive use throughout the mine. The plant was installed by the General Electric Co., tram-lines averaging about 1,800' each in length, with gradients of 1.5% towards the shafts. The equipment includes 15 electric locomotives, each weighing 5,500 lbs., standing 3' high by 43" wide and 9' long, with draw-bar pull of 700 lbs. on a level track, each hauling 4 or 5 three-ton rock-cars, at a speed of 6 to 8 miles per hour, one man caring for each train. The 49th level is to be electrified, and the haulage plant will be extended to No. 8 shaft, on that level, from end to end of the mine. The underground traction power plant is on the 57th level of No. 2 shaft, having a 100-kw. direct current generator operating the haulage system. Tram-cars are unloaded into 500-tons storage bins, built on the hanging-wall side of the shafts, there being such bins on two levels of No. 2 shaft, 4 levels of No. 6 shaft and 7 levels of No. 7 shaft. This system of storage obviates the loss of time by either the tram-lines or skips, and adds at least 25% to the hoisting capacity of the mine.

The mine employs 180 power drills, in drifting and stoping, and the diamond drill is used extensively in exploratory work. The mine is troubled by air-blasts, these being violent disturbances caused by the settling of superincumbent rock in the scores of miles of worked-out openings, causing violent compression of the air elsewhere throughout the mine, and giving considerable trouble, with occasional loss of life. The most serious disturbances from air-blasts, which practically are artificial earthquakes of local scope, felt for only a few miles distance upon surface, were experienced

in February, 1906. There seems reason to fear that these troubles will be a concomitant of the deep-level operations of the Quincy, in the older workings, for the balance of the mine's history.

Owing to the absorption of the Pewabic and Mesnard mines, shafts are numbered irregularly. The southernmost is No. 7, of 5,162' depth, to the 59th level; 860' next north is No. 4, which is 4,186' deep, to the 51st level; 585' next north is No. 2, which is 5,289' deep, to the 61st level, being more than one mile in depth, and the deepest in the Lake Superior district, outside of the Calumet & Hecla and Tamarack mines; 1,928' next north is No. 6, which is 5,255' deep, to the 60th level, and 4,168' north is No. 8, the Mesnard shaft, 3,354' deep, to the 24th level, corresponding to the 42d level of No. 6. Extreme distance is 7,541' between No. 7 and No. 8 shafts, the Franklin mine intervening between shafts Nos. 6 and 8.

No. 7 shaft, planned and sunk by Mr. John L. Harris, is on a catenary curve, leaving surface at an angle of 53°, but bottomed at about 37° 30'. The shaft was sunk 4,000' in 18 months, through exceedingly refractory rock, this speed being made possible by sinking and raising in 5 sections, simultaneously. The steel shaft-rockhouse is 100' high, with large wings, fitted with a steam-hammer and 5 Hodge crushers. This shaft has an 8,000-h. p. Allis-Chalmers Corliss hoist, with 52x84" cylinders, and winding drums 28' in diameter by 11' 9" face, carrying 8,000' of 1½" steel cable, capable of raising 6-ton skips from a depth of 1½ miles, at a speed of 3,000' per minute, hoisting being limited to this rate by an automatic cut-off, which also prevents over-winding. Starting a load of 6 tons from a depth of nearly one mile, the hoist, if untouched, will check, without damage, after raising the skip a few feet higher than the appointed place in the shaft-house. The main shaft carrying the drum weighs 60 tons. The engine-house is 58x94', with a 56x92' boiler-house adjoining, both of stone, with steel truss roofs. This shaft produces about 1,000 tons of rock daily, or approximately 30% of the total output of the mine.

The stoping ground tributary to No. 4 shaft being nearly exhausted, and as a new hoist would be required for greater depth, and the lower stretches of ground tributary to No. 4 can be reached easily from No. 7 by electric trams, it was planned to abandon No. 4 and raise the water heretofore forked from No. 4 through shafts Nos. 2, 6 and 7, these having 1,300-gallon bailers for the purpose. Previous to abandoning the shaft, a more systematic attempt was made to develop payable ground on the West Lode. This has been successful, to the point of opening several years reserves of stoping ground that will yield a profit with copper at 15 cents per pound, or better, but this ground probably would be unpayable at a lower price for the metal. The value of the West Lode, however, is very great, to a mine so circumstanced as the Quincy, which has ample facilities for treating the very lowest grade of stamp-rock that can be worked at a profit, with need for opening new ore reserves. The West Lode is not likely to prove a bonanza, at any point, but it is likely to yield many millions of pounds of copper, secured at some sort of a profit, which, in this case, will mean a net profit. Surface

equipment at No. 4 shaft includes air-compressors of 40 drills aggregate capacity.

The surface equipment at No. 2 shaft is practically a duplicate of that at No. 7, including two 60-drill air-compressors.

No. 6 shaft is only 200' south of the boundary line of the Quincy and Franklin mines, and production will be somewhat decreased, owing to No. 8 taking considerable ground heretofore tributary to No. 6, under the Franklin mine. No. 6 has an Allis-Chalmers duplex hoist with a 22' 6" straight-face drum raising 8-ton skips. The power-house has a centrifugal feed-water heater attached to one cylinder of the duplex hoist. The air-compressor at No. 6 has been remodeled to a two-stage compound engine, increasing its capacity to 100 power drills.

No. 8 shaft, on the Mesnard tract, showed poorly in the upper levels, but the lower workings, while by no means up to the old Quincy average, in either quantity or quality of rock developed, show a wider and better mineralized lode than above, and of satisfactory grade, as the mine now averages. The improvement began with the 10th level, and from the 20th level downward the shaft develops productive ground nearly or quite up to the present average of the old Quincy and Pewabic workings, the best ground being shown to the southward, which is not altogether encouraging for the mile of undeveloped ground in the Mesnard and Pontiac tracts, to the northward, toward the Franklin Junior mine. Levels in No. 8 are opened uniformly at distances of 135', and the connection between No. 6 and 8 shafts, secured July 15, 1906, is on the 24th level of No. 8 and the 42d level of No. 6, at a depth of 3,354' from surface. This level passes underneath the entire workings of the old Franklin mine, which was estopped by its boundry lines from following the Pewabic lode to greater depth. No. 8, at the end of 1905, was producing circa 400 tons of stamp-rock daily, to be increased to 1,000 tons per diem, when the new equipment permits the hoisting of a heavier tonnage.

The permanent plant at No. 8 includes a shaft-rockhouse similar in design and equipment to those at Nos. 2 and 6, with a structural steel addition, building in 1906, that will increase the capacity to at least 1,200 tons daily. The new power plant is under one roof, in a building 52x140', with a 9' basement under the engine-room. The old hoist, good for 4,000' only, is to be replaced by a permanent Nordberg hoist, with 32x72" duplex cylinders, and double conical drum with 12' 6" minimum and 18' 6" maximum diameter, good for 6,000' depth. The boiler-room has 3 Burt locomotive firebox boilers, with room for 3 more. The smokestack, of 140' height, on a 15' base, is of steel-reinforced concrete. The power plant has extensive coal-bunkers under the same roof, with direct rail connection over a trestle.

At the shaft-rockhouses the stamp-rock is dumped from the skips, as hoisted, upon grizzlies of 2" steel bars, placed 2" apart, at an angle of 45° in an upper section, with a lower section at 20° only, in which bars are 12" apart from center to center, the combination grizzly assorting rock automatically into two grades, the fine stuff going to ore-bins and the coarse falling into two chutes, receiving equal portions, which feed direct to two rock-crushers

on the floor below, no shoveling being required. The heavy rock, too large to pass the 10" aperture in the lower section of the grizzly, falls to the floor, and is broken by a trip-hammer. The new grizzlies save one-half on rock-house labor, and greatly lighten the work of the remaining employees.

The surface plant is exceptionally complete. Near No. 2 shaft is the 62x145' machine shop, of stone, brick and steel, with truss roof, absolutely fire-proof, having a traveling crane covering the entire shop, with a complete equipment of modern machinery and tools. Adjoining is a 53x69' compressor-house, of stone and steel, with fire-proof truss roof, housing two 60-drill cross-compound two-stage condensing right-and-left-hand Corliss air-compressors, so connected that air from them is available in any part of the mine, the cross-connection eliminating danger of inadequate air supply through disabling of either section. Steam from the compressor plant exhausts into a dam built for the purpose. A plastered brick tunnel, connecting boiler-house, machine shop and compressor plant, serves as a conduit for steam and air pipes. The blacksmith shop is 50x154', with a 50x90' wing, of ashlar-finished redstone, with fire-proof steel truss roof having 3 large ventilators, equipped with 12 forges, steam-hammers, fan, bolt-cutters, drills, grindstone, etc., being a model smithy in every respect.

Near No. 7 shaft are two boiler-houses, each having eight 100-h. p. Roberts tubular return horizontal boilers. A 56x75' boiler-house at No. 6 shaft has four 250-h. p. Wickes water-tube vertical boilers and nine 100-h. p. horizontal locomotive firebox boilers, also a powerful fire-pump. The water for boilers and mine location is taken from Portage Lake, the pumping station, on the margin of the lake, being of ashlar-finished redstone, the pumps forcing water for one mile, against a head of 640'. The coal-yard is between shafts Nos. 2 and 4. Steam engines have been replaced by electric motors, in the carpenter shop, roundhouse and smithy.

The mine has a private telephone system, with 25 instruments connecting the principal mine and mill buildings, and a 20x25' frame exchange building. The company owns several hundred dwellings, the newer structures being mostly of 7-room size, on solid stone foundations, the mine location being noted for its neatness. The company also has extensive holdings of valuable land in and adjoining the city of Hancock, and portions of this ground are platted from time to time, for residence purposes, and sold at good prices.

The company's private railway, built 1890, and known as the Quincy & Torch Lake Railroad, is 6 miles long, touching all of the shafts and shops at the mine, and at the boiler-house, wharves and coal-shed at the mill, and is connected with the Mineral Range, Hancock & Calumet and Copper Range railroads. The rail line has solid rock ballasting and steel bridges, with a continuous down-grade haul between the mine and the mill. Equipment includes 6 locomotives, sundry freight cars and nearly 150 hopper-cars for rock, the latter having automatic couplers and air-brakes. The roundhouse is near No. 7 shaft, and has a 36x40' addition containing a special machine shop, for the use of the railroad.

The mills are at Mason, on Torch Lake. No. 1 mill, of wood, has 5 Allis-Chalmers 2-way stamps, with 20" cylinders, using the coarse stamping system. Dressing machinery includes 92 Hodge jigs and 30 Wilfley tables. No. 2 mill, standing 630' north of the old plant, is 132x216' in size, of steel on stone foundations, with 180 windows, each having 13½ sq. ft. of glass, flooding the interior with light. This mill has three 20" Allis-Chalmers heads, each stamp set on foundations of heavy timbers and concrete, surmounted by a bottom plate of 22 tons, a middle plate of 18 tons and a top plate of 18 tons, all of solid iron castings, above which are the mortar-boxes of the stamps. One head was remodeled, as a steeple-compound stamp, in 1905, and this is being carefully tested, the water condensed from steam used being weighed, giving a close check on the duty of the engine. Finisher jigs and slime-tables have been replaced by 24 Wilfley tables, 8 for each stamp, assisted by 4 Standard concentrators. Each stamp has 12 rough jigs, 6 Wilfleys for finishing and 2 Wilfleys and 1 Standard table for slimes. Stamps have 1" revolving screens for mortar-boxes and the mill has a settler, from which slimes are taken to the Wilfley tables. Regrinding is done by a Trent Chilean grinder, with 3 jigs and 3 Wilfleys as auxiliaries. Regrinding of raggings in No. 1 is done by an Allis-Chalmers Huntington mill. The mortars of all stamps have hydraulic discharges, as have the launders leading from the mortars, these giving about 60% of the total production of copper secured at the mills. By the adoption of the hydraulic discharges and other improvements, the capacity of the stamp-heads has been increased about 25%, while changes in the wash have given an increased capacity of 30%, with labor costs reduced 25% and loss in tailings cut down 40% to 50%. About 35% of the present product of the mill is No. 3 grade mineral, carrying very fine copper. The stamping capacity of the two mills is about 4,000 tons daily.

Mineral from both mills goes to mineral-bins at No. 1 mill, being conveyed thereto in buckets, by overhead trolley, from the wash-room in No. 1 mill, and from No. 2 mill in hopper-cars by an electric locomotive traversing a 650' track connecting the two mills. The mineral bins are of concrete and cement, and are kept at a temperature of 80°, to dry out the water remaining from the wash. Gates of the bins are operated by steam pistons, and there is a 54' platform-scale, with minimum weighing capacity of 10 lbs. and maximum capacity of 110 tons.

The power plant of the mills, at No. 2, is housed in a 56x90' building, of steel frame on stone foundations, and has a 100' smokestack on a 30' foundation. Equipment includes four 250-h. p. Wickes vertical water-tube boilers. The equipment includes an electric light plant, and in connection there is a machine shop, and several buildings for minor uses.

The 54x54' brick and steel pumphouse at the mill has a 20,000,000-gallon Allis-Chalmers vertical triple-expansion pump, and the old pumphouse has three pumps with a combined capacity of 21,000,000 gallons daily. Water is taken from a 7x7' 6" tunnel, driven 100' under the bed of the lake. A 6x6' 6" tunnel 440' long connects the mills, boiler-houses and pump-houses, this being bricked and plastered inside, and carrying both water and steam

pipes. A considerable village, made up solely of employees and their families, has grown up about the mills.

The Quincy has three docks, of which the first is at Hancock, with a 40x416' wharf and a 64x124' warehouse, having deep water in front and railroad tracks behind. A second dock, at the Ripley smelter, has a 350' shipping wharf for copper and a 250' coal-wharf. The third dock, at the Torch Lake mills, has a 40x400' wharf, built of Washington fir, with 18' of water alongside, on it fronting a 300x300' coal-shed, of steel, with corrugated iron siding and roofing, having storage capacity for 80,000 tons of bituminous coal, this being about the annual consumption of the mine and mills. There are three coal-hoists, operated by steam power, capable of unloading 100 tons per hour each. These have 120' steel towers, traveling on a track 22' wide and 300' long, running the entire length of the shed. The plant was built by the American Bridge Co., at a cost of about \$200,000, and effects a saving of circa 12 cents per ton on all coal used. The railroad reaches the coal-shed by a 650' trestle, partly of timber and partly with steel bents, supported on 240 concrete piers.

The Quincy smelter, at Ripley, on the shore of Portage Lake, opposite Houghton, just east of Hancock, and only a half-mile from the mine, was blown in Dec. 1, 1898. The principal buildings are of redstone, with ashlar finish. The mineral house, 40x95', is reached by a 460' trestle, mineral arriving from the mills in hopper-bottom cars, and being dumped into storage-bins, whence it is drawn off, as required for smelting, into steel trucks, running on rails under the gates of the bins. On arriving at the reverberatory building, which is 84x144', with four 40-ton furnaces, the trucks are lifted by electric cranes and contents dumped into the reverberatories. A second furnace building, erected 1904, has a 60-ton reverberatory, equipped with an automatic casting machine. An overhead trolley in the main furnace building permits handling large bars and cakes, and a trolley-dipping system is in use for casting. Owing to lack of dumping room for slag, a new system has been installed, by which 3,000-lb. slag-pots have replaced the diminutive pots formerly used. The pots are trammed from the furnaces to a 30' hydraulic elevator, which raises the pots and contents, dumping the latter over the end of a trestle. Other structures at the reduction plant include a cupola-building, engine-house, casting-house, cooper-shop, office, laboratory, coal-shed and a 50x100' warehouse. In addition to treating the product of its own mine, the Quincy smelter does custom work for the Franklin, Adventure, Allouez and Centennial mines, and will smelt the mineral of the Copper Concentrating Co.

Production of fine copper has remained practically stationary for four years, at eighteen-million-odd pounds, showing a very small gain in 1905 offset by a slight loss in the first half of 1906, due to trouble, in February, from air-blasts. The yield of 1905 was only 277 lbs. fine copper per fathom of ground broken, which is much the lowest return ever secured, being less than one-half the return of 1894, only 11 years previous, and less than one-third the return of 1883, 22 years before—notwithstanding which the mine

earned nearly a million dollars net, during 1905. The 1905 product of 18,827,557 lbs. fine copper was secured from 1,135,162 tons of rock stamped, giving returns of only 16.5 lbs. fine copper per ton—a figure that would have spelled utter ruin, as recently as 15 years ago. For 1905 the combined cost of smelting, transportation and eastern office expenses was less than $\frac{3}{4}$ cent per pound—a very creditable figure.

The wisdom of the heavy outlay for improvements, begun in 1898, was questioned at that time, by many shareholders, but is no longer open to doubt. Without those improvements the Quincy would be a decadent property, with a few uncertain years of life remaining, as a "scram" with steadily decreasing output, instead of the vigorous and profitable property it stands to-day.

At a special meeting of the stockholders held August 8, 1906, it was voted to double the company's capitalization. It is evident that the Quincy management is seriously considering the advisability of branching out, by the purchase of new mineral lands, something on the plan of the Calumet & Hecla. While such a step means a radical departure from the traditionally conservative policy of the company, for nearly 60 years past, its wisdom does not seem open to serious doubt. In the Twentieth Century, mines, like men, that stand still, are retrograding. It's a case of keep up with the procession, or fall back to the rear, discredited and hopelessly beaten in the race for success.

QUINCY MINING CO.

UTAH.

Property sold, April, 1902, to Daly West Mining Co.

QUINTERA MINING CO., LTD.

MEXICO.

Offices: 20, Bishopsgate St., London, E. C., Eng., and 2, Square de l'Opera, Paris, France. Mine office: Alamos, Sonora, Mex. J. Kulp, chairman; J. Herbert, manager; J. G. Mills, secretary. Organized May 4, 1888, with capitalization £52,000, shares £1 par. Pays annual dividends of 2s. to 5s. It is primarily a silver mine, making lead and copper as by-products. Main shaft is 1,100'. Has steam and electric power, 20-stamp mill, 20-ton leaching plant, 25-ton concentrator and 35-ton smelter, employing several hundred men. Production, 1903, was 18,000 kgs. fine copper.

RADIUM MINES CO.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. Lands, 60 claims, circa 4 miles north of the Old Dominion, in a block of 1 to 2 miles width and nearly 4 miles length, running eastward from Pinal Creek. Ten or more of these claims have produced \$10,000 to \$20,000 each, from surface ores raised by hand-windlasses. A shaft is being sunk, to connect with a tunnel now driving, on the Golden Wonder claim.

RAI MINE.

INDIA.

Is in the Kumaon division, Northwest India. The Himalaya Mining Corporation, Ltd., now dead, was organized, 1902, to take over this property.

RAINBOW MINES.

OREGON.

Office: care of H. Banfield, owner, 375 Alden St., Portland, Ore. Property, located in Douglass county, Oregon, has some development.

RAMBLER COPPER MINING CO.**ARIZONA.**

Dead. Lands sold, February, 1903, to Lyon Copper Mining Co.

RAMBLER COPPER MINING CO.**WYOMING.**

Succeeded, Oct. 1, 1902, by Rambler Mining & Smelting Co.

RAMBLER EXTENSION MINE.**WYOMING.**

Includes the Big Nell and adjoining claims, in Albany county, Wyoming.

RAMBLER MINING CO.**WYOMING.**

Office and mine: Rambler, Carbon Co., Wyo. Idle. S. H. Potter, president; Aaron Slothower, treasurer and general manager; L. S. Niece, secretary. Organized under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par. Lands, 9 claims, area 160 acres, in the Battle Lake district, showing veins occurring as fissures in diabase schists and as contacts between diabase and quartzite, veins ranging 1' to 6' in width, and giving assays up to 25% copper and \$1 to \$10 gold per ton, from oxide, carbonate and sulphide ores. Development is by a 100' main shaft and a 550' crosscut tunnel. Idle for several years.

RAMBLER MINING & SMELTING CO.**WYOMING.**

Office: 327 New York Life Bldg., Chicago, Ills. Mine office: Holmes, Albany Co., Wyo. Employs 5 men. Frank M. Wootton, president; Frank C. Sheldon, vice-president; Milton M. Green, secretary; A. C. Jones, treasurer; preceding officers, C. W. Cheney, J. H. Tribby, Frank T. Day, E. A. Wixen and Chas. Custer, directors. Organized October, 1902, under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par. Property is leased to the North American Exploitation Co., which holds a large majority of the stock.

Lands, 10 claims, area 200 acres, at the head of Douglass creek, on the crest of the Medicine Bow Mountains, fairly timbered with spruce and pine. Mine was opened for gold, 1870 and relocated for copper, 1900. Country rock is grano-diorite, and ore body apparently is a fault-fissure. Mine is opened by a 65' vertical shaft, from bottom of which an incline runs, on the vein, at an angle of 45°, with three levels opened, and by a vertical main working shaft 175' deep, connected with the original workings on the second and third levels. The mine has circa 2,800' of underground openings, and is claimed to have 22,100 tons of ore, ranging from 20% to 45% copper, blocked out for stoping, on the first and second levels. Exact size of the ore body is undetermined, but ore gives assays ranging from 6% to 39% copper, with average returns of about 33% copper, from carefully hand-selected ore, shipped in 1902. Ore has a gangue of decomposed granite, giving talcose alteration products and carrying more or less pyrite, hematite and marcasite, all useful fluxes and all carrying small percentages of copper. The gangue is easily separable, if concentration should be desired, on the low-grade ores.

The Rambler carries a great variety of copper minerals, in various stages of alteration, associated with sundry rare metals in commercial quantities, but comparatively free from such deleterious elements as antimony, bismuth and arsenic. The vein carries a little native copper, in mag-

gets and dendrites, associated with cuprite, in the upper levels, and also gives melaconite, chalcocite, covellite, chalcopyrite and chrysocolla, and is especially notable for containing large quantities of covellite carrying gold, iridium, osmium, palladium and platinum, the latter occurring as sperrylite, the only known occurrences of platinum with copper being in Wyoming. Assays of Rambler matte have given returns as follows, per ton of blister copper: 6.75 oz. silver, 2.25 oz. gold and platinum, and 6 oz. palladium. The value of the palladium is contingent upon finding a market for this rare metal at \$10 per ounce, in considerable quantities. Cost of refining the matte and separating the various rare metals is approximately \$40 per ton, or 2 cents per pound of blister copper.

Surface improvements include a 21x44' shafthouse, ore-bins connected with shafthouse and smelter by trestle, carpenter shop, smithy, office, assay office, sawmill, boarding house and bunk-houses, also a smelter with a 40-ton water-jacket blast-furnace. Production, 1903, was 249,196 lbs. fine copper, since which time the mine has been idle, except for a few men on development work. Production cannot be made to advantage without rail connections, now lacking. Property is considered valuable, but management is not favorably regarded.

RAMMELSBERG MINE.

GERMANY.

Office and mines: care of Königliches Oberbergamt, Clausthal im Harz, Germany. Employs circa 650 men. Bergrat Richard, director. Property is owned jointly by the Crown of Prussia and the Duchy of Brunswick. Is a very ancient mine, worked since A. D. 972. The ore occurs as a great lense, 40' to 50' in width and about 4,000' long, country rocks being schists intercalated in Devonian slates. Ore is a dense mixture of chalcopyrite, galena, sphalerite and pyrite, with occasional tetrahedrite.

The mine is developed by shafts of 296 metres and 316 metres, and has about 15,000 metres of openings, estimated to show about 15,000,000 metric tons of cupriferous slates carrying an average of about 4.5% copper, 10% lead, 20% zinc and 3 oz. silver per ton. Mine has 2 hoists, good for 350 metres depth each, and a 30-drill air-compressor.

The smelter, at the mines, is of 300 tons daily capacity. Equipment includes 20 kilns and ovens for calcining, twelve 25-ton blast-furnaces and five fifteen-ton reverberatory furnaces. Product is turned out as blister copper and anodes. The works also have an electrolytic refinery, and an acid plant, annual capacity of latter being 25,000 tons of sulphuric acid of 50° Beaumé. Annual production of the works is about 1,700 metric tons of refined copper, in various forms, and 1,100 tons of bluestone. Production, 1902, was 3,608,930 lbs. electrolytic copper; 1,074 metric tons blue vitriol; 96.5 kgs. refined gold, 11,522 kgs. refined silver; 5,239 metric tons lead, also minor by-products including copperas, zinc-vitriol, soda, etc. Production, 1905, was 3,527,360 lbs. fine copper.

JOSÉ TOMÁS RAMOS.

CHILE.

Owne the Chalinga mine, in the department of Ilaapel, Chile. Idle.

MINA DE RAMOS.**MEXICO.**

Office: care of D. E. Murphy, lessee, Aguascalientes, Mex. Mine office: Ramos, San Luis Potosí, Mex. Francis H. Sisterman, general manager. Is a producer of silver and copper. Main tunnel, 1,000'. Has steam and gasoline power and a concentrator, employing 250 men, at last accounts.

COMPañIA MINERA IGNACIO RODRIGUEZ**MEXICO.****RAMOS, S. A.**

Office: Jiménez, Chih., Mex. Mine office: Baca, Chihuahua, Mexico. Alfredo Rodriguez, president; Rafael L. Luiroz, general manager; Ramón G. Aguirre, superintendent. Organized 1902, under laws of Mexico. Lands, 15 pertenencias. Country rock is limestone, carrying ore bodies occurring as replacements in lime. One lense, under development, has a width of 78' and length of 140', with depth not ascertained, carrying malachite, azurite and galena, averaging 5% copper, 25% lead, 6% zinc, 15 oz. silver and \$8 gold per ton, opened by an 800' shaft and tunnels of 400' and 900'. Mine has a steam hoist and two electric drills, and ships ore to the American Smelting & Refining Co., for reduction. Production, 1905, was circa 35,000 metric tons of ore, and production therefrom is estimated at 2,750,000 pounds fine copper.

RAMSDELL-PARROT MINE.**MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Is connected on the 400' and 500' levels with the Colusa-Parrot mine.

RANKIN COPPER MINING CO.**WYOMING.**

Office and mine: Rawlins, Carbon Co., Wyo. Organized 1904, with capitalization \$25,000. Presumably idle.

RANSON COPPER MINING COMPANY OF ONTARIO, LTD.**ONTARIO.**

Office: Sault Ste Marie, Mich. B. Frank, president; David Rustander, secretary; D. J. Ranson, superintendent; R. H. Taylor, consulting engineer. Organized 1902, under laws of Ontario, with capitalization \$3,000,000, shares \$1 par. Lands, 3,600 acres, in Chesley and Anderson townships, Algoma, Ontario, said to show 14 veins, of which 6 contact veins have been opened by 8 shafts, of 23' to 75' depth, veins averaging 25' width and giving assay values of 12% copper and 3 oz. silver per ton, from chalcopryrite. Has steam power. Idle for several years.

RARITAN COPPER WORKS.**NEW JERSEY.**

Owned by United Metals Selling Co.

RARUS MINE.**MONTANA.**

Owned by Butte Coalition Mining Co.

RAVEN MINE.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Wyo.

RAVEN MINING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. W. L. Thornton, president; John Berkin, vice-president and general manager; Chas. Mattison, secretary and treasurer. Organized 1903, with capitalization \$500,000, shares \$1 par. Bonds, \$65,000 issued. Amount of cash in treasury probably is small.

Lands include the Raven mine, owned outright, and a 6-7 interest in the Snoozer mine, balance of 1-7 of latter being owned by the Red Metal Mining Co., which is the operating company of the Butte Coalition Mining Co. Area of Raven and Snoozer claims is 23 acres. Lands have an east and west length of circa 2,000', in line with the Mountain Consolidated mine of the Boston & Montana. The Raven shows 3 plainly defined veins, and has a 625' shaft, on which no mining has been done recently. To a depth of circa 500' the Raven was a silver-gold mine, producing ores carrying an average of 16 oz. silver per ton, with good gold values, and is said to have produced circa \$150,000. At depth copper is increasing, showing ores of 1% to 2.5% tenor at the bottom of the shaft.

The Snoozer mine has shafts of 75' and 125', both idle, production being secured through the Buffalo shaft of the Anaconda company. The Snoozer shows 4 veins and ore produced therefrom is said to average 4% copper, 8 oz. silver and \$1.25 gold per ton. The Snoozer has been opened on the 800' and 1,200' levels by crosscuts from the Buffalo shaft of the Anaconda, and a crosscut is opening the 1,500' level. The 1,200' level shows a 4' vein carrying ore averaging 11.6% copper, 9 oz. silver and \$8 gold per ton. Work was suspended January, 1906, owing to the use of the Buffalo shaft being taken away, temporarily, but in February, 1906, the Raven was shipping 35 to 40 tons of ore daily, to the Washoe smelter of the Anaconda.

The Raven lands are well located, though small in area, but there has been entirely too much stock-market manipulation, during the past year, the responsibility for which has not been fully placed.

RAWLEY MINING CO.

COLORADO.

Mine office: Bonanza, Saguache Co., Colo. David G. Weems, manager. Ores carry lead, silver and copper. Has steam and electric power.

RAY COPPER MINES, LTD.

AUSTRALIA.

Offices: 1, Gresham Bldgs., London, E. C., Eng. Mine office: Ray, Pinal Co., Ariz. Employs 9 men. A. C. Gordon, manager; W. H. Westerfelt, metallurgical superintendent. Property has been in the hands of a receiver, since 1901, owing to bad management and litigation. Lands, 1,296 acres, on Mineral Creek. Mine is opened by shafts and tunnels, and equipment included steam and gasoline power and a 6-mile narrow-gauge railroad, connecting the mines and works. The reduction plant included a 250-ton concentrator and a smelter, erected circa 1897, but never blown in, which was burned March, 1906.

The mine is under lease to the Kelvin Reduction Co., and has been estimated to show nearly 1,000,000 tons of ore averaging 4.5% copper. Sundry tests, in 1905, are said to have produced concentrates averaging 31.5% copper, with small gold and silver values. An experimental leaching plant is in operation.

RAYNOR COPPER MINING CO.

CALIFORNIA.

Office: 1003 Call Bldg., San Francisco, Cal. Mine office: Lewis, Mariposa Co., Cal. John N. Bourdette, president; H. V. Raynor, secretary;

John C. Jens, manager. Has carbonate and sulphide copper ores, opened by shafts, with gasoline power. Presumably idle.

READY BULLION COPPER CO.

Office: 517-131 State St., Boston, Mass.

READY PAY MINING CO.

NEW MEXICO.

Mine office: Hillsboro, Sierra Co., N. M. Ores carry gold, silver and copper. Idle.

COMPAÑIA MINERA REAL DEL MONTE y PACHUCA.

MEXICO.

Mine office: Pachuca, Chihuahua, Mex. Pablo Martinez del Rio, president; A. F. Holden, managing director; preceding officers, W. H. Coolidge, E. A. Clark and Señor Eiguero directors; M. B. Spaulding, manager; T. H. France, consulting engineer. Control passed, February, 1906, to United States Smelting, Refining & Mining Co., through the purchase of a majority of stock.

NEGOCIACION MINERA REAL DEL MONTE,

MEXICO.

UNION y BILBOA.

Mine office: Ojocaliente, Zacatecas, Mex. H. Dalonne, manager. Has cupriferous silver-lead ores. Employed about 125 men, at last accounts, and planned installing a steam plant and small mill.

REALITO MINING CO.

MEXICO.

Letter returned unclaimed from former office, Guadalajara, Mex. Mine office: Tapalpa, Jalisco, Mexico. Silviano Camberos, manager. Lands, 25 pertenencias, near Chiquilistlán, 50 kilometers northwest of Sayula, including the Cuprifer, Rinconada and Sin Nombre groups. Ore occurs in "mantos" and fissures, giving assays up to 60% copper, 2 kgs. silver and \$10 gold per ton. A little ore, smelted in adobe furnaces, at the mines, has given good returns.

REALITY SYNDICATE.

CALIFORNIA.

Succeeded by California Improvement Co.

REBECCA COPPER MINING CO.

Office: 542 The Rookery, Spokane, Wash. Moribund.

REBECCA EXTENSION COPPER MINING CO.

Office: Spokane, Wash. Moribund.

MINA LA RECOMPENSA.

MEXICO.

Mine office: Santa Maria Dolores, Durango, Mex. P. J. Opperman, superintendent. Ores carry gold, copper and zinc. Has steam and water power and a 10-stamp mill, employing circa 50 men, at last accounts.

RED BIRD MINING CO.

MONTANA.

Office: Helena, Mont. Mine office: Austin, Lewis & Clark Co., Mont. Employs 24 men. J. M. Clements, president and treasurer; Frank Jacquemin, vice-president; A. A. Pelletier, secretary and general manager; preceding officers, Robert Lucas and C. O. Clark, directors; J. C. McNamara, superintendent. Organized August 18, 1902, under laws of Montana, with capitalization \$1,500,000, shares \$5 par; issued, \$1,437,500. Has paid dividends of \$72,000, to end of 1905.

Lands, 7 claims, area 140 acres, including the Red Bird mine, in the

Greenhorn district, showing granite and limestone country rocks, carrying 15 fissure veins, of which 2, of 5' average width are developed by the 400' Red Bird shaft and the 300' Copper Hill shaft. The Copper Hill mine shows sulphide ore averaging 1.3% copper, with a 30% excess of iron, in a 60' vein, and is to be explored by diamond drill. The Red Bird mine is extensively developed, having about one mile of workings, estimated to put 250,000 tons of ore in sight. Estimated average ore values of the Red Bird, as given by a former management, were 21% copper, 45% lead, 35 oz. silver and \$5 gold per ton, but these figures probably were excessive.

Equipment includes a 180-h. p. steam plant, with 4 hoists, good for 500' depth, and a 4-drill air-compressor, also 5 mine buildings, for various uses. Ore is shipped to the Helena smelter, over the Southern Pacific railroad, which reaches the mine by a one-mile spur. Management is good and property is considered valuable.

RED CLOUD MINE.**MONTANA.**

Office and mine: Garnet, Granite Co., Mont. Dr. Peter Mussigbrod, manager. Ores carry gold, silver, copper and lead. Has a 10-stamp mill and steam power, employing circa 35 men.

RED CLOUD MINING CO.**CALIFORNIA.**

Office: Los Angeles, Cal. Mine office: Salton, Riverside Co., Cal. E. H. Gould, superintendent. Ores carry gold, silver, copper and lead. Has steam and gasoline power, 2-stamp mill, concentrator and 80-ton smelter. Presumably idle.

REDDING GOLD & COPPER MINING CO.**CALIFORNIA.**

Office: 222 California Safe Deposit Bldg., San Francisco, Cal. Mine office: Redding, Shasta Co., Cal. Employs 12 men. H. D. Irwin, president; T. M. Gilbert, vice-president and general manager; Thos. Gilbert, secretary; J. H. Creighton, superintendent; preceding officers, F. E. Mayhew, A. Ahnefeld and P. N. Ramussen, directors. Organized under laws of South Dakota, with capitalization \$1,000,000. Has authorized a bond issue, amount not learned, at 6%. Lands, circa 30 claims, including the Bedford group, north of the Sky Blue group, at the mouth of Middle Creek, and sundry claims at Clear Creek, in the Muletown district, circa 7 miles west of Redding, also placer gold claims. In September, 1905, was damming Clear Creek one mile above the Redding and Eagle bridge, to develop a 70' head, for a hydro-electric power plant, and was said to plan building a 500-ton custom smelter, on which work was to have begun in spring of 1906.

REDEMPTION MINE.**ARIZONA.**

Office and mine: care of R. J. Ferguson & Sons, owners, Chloride, Mohave Co., Ariz. Ores are auriferous and argentiferous copper oxides. Idle.

RED FOX MINING CO.**BRITISH COLUMBIA.**

Mine office: McGuigan, Yale district, B. C. Has argentiferous lead and copper ores, slightly developed. Presumably idle.

RED HILL MINING & SMELTING CO.**CALIFORNIA.**

Office: care of C. B. Allen, secretary, Los Angeles, Cal. Dr. C. J. Allen,

president; J. W. Jackson, vice-president. Lands, sundry claims, circa 10 miles from Victor, San Bernardino county, California. Idle and apparently moribund.

RED JACKET & BISBEE DEVELOPMENT CO.

ARIZONA.

Out of business. Fully described in Vol. IV.

RED METAL MINING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Thos. F. Cole, president; W. D. Thornton, vice-president; preceding officers, J. C. Lalor, C. D. Fraser and James O'Grady, directors; Arthur C. Carson, general manager; Geo. Moulthrop, general superintendent. Organized February, 1906, under laws of New York, with capitalization \$1,000,000. Entire stock issue is held by the Butte Coalition Mining Co., and the Red Metal Mining Co. is a holding company for the Butte Coalition, direct title to lands being vested in the Red Metal Mining Co. Holdings are supposed to include the lands described under the title of Butte Coalition Mining Co., also the Alice mine and a few other small properties, including a seventh interest in the Snoozer mine of the Raven Mining Co.

RED MOUNTAIN GOLD & COPPER REDUCTION CO.

WASHINGTON.

Letter returned unclaimed from former office, care of Scandinavian-American Bank, Seattle, Wash. Lands are in Chelan county, Washington.

RED ROCK COPPER CO.

ARIZONA.

Mine office: Tuscon, Pima, Co., Ariz. J. C. Perry, agent. Idle.

RED STAR MINE.

BRITISH COLUMBIA.

Mine office: Princeton, Yale district, B. C. Lands, one claim, opened by tunnel, showing a vein of 6" to 6' width, carrying melaconite and chalcopyrite, assaying up to 27% copper and \$4 gold and silver per ton.

RED STAR MINING CO.

WASHINGTON.

Mine office: Kalama, Cowlitz Co., Wash. Ores carry gold, cinnabar and copper. Idle.

RED WING MINE.

ALASKA.

Mine office: Ketchikan, Alaska. Capt. E. E. Wyman, owner. Plans installing an air-compressor and power drills, and beginning smelter shipments, during 1906.

RED WING EXTENSION MINING CO.

UTAH.

Title changed, circa March, 1906, to Massasoit Mining Co.

RED WING MINING & MILLING CO.

UTAH.

Succeeded, circa 1900, by New Red Wing Mining Co.

REDWOOD COPPER QUEEN MINING CO.

CALIFORNIA.

Office: San Francisco, Cal. W. P. Ferguson, president; Thos. Mellersh, secretary and treasurer. Lands, 840 acres, patented, 35 miles southeast of Ukiah, Mendocino county, California, developed by tunnels and winzes. Vein, much broken by faults prominent on surface, has a 2' to 4' gossan capping, traceable for a mile. Country rocks are brecciated porphyry and sandstone. Ores include cuprite, melaconite, malachite, azurite, chalcopryrite and tetrahedrite. Idle.

REED GOLD & COPPER MINING CO.

VIRGINIA.

Letter returned unclaimed from former office, Norfolk, Va.

REED'S CREEK MINE.

AUSTRALIA.

Owned by Queensland Copper Co., Ltd.

REFORMA MINING CO.

MEXICO.

Letter returned unclaimed from former mine office, Fuerte, Sinaloa, Mexico.

REFUGIO GROUP.

MEXICO.

Letter returned unclaimed from former mine office, La Cananea, Sonora, Mexico. Lands, circa 900 acres, said to have been sold, 1905, to Archibald & Marshall, of London.

CAMPAÑA MINERA LA REINA.

MEXICO.

Mine office: Cusihiuiriáchic, Chihuahua, Mex. Ramón Navarro, president and manager. Property is a mine producing gold, silver, lead and copper, latter in very small quantities, as a by-product. Has gasoline power and three Huntington mills, employing about 150 men.

MINA REINA DE COBRE.

MEXICO.

Mine office: Alamos, Sonora, Mexico. Alfredo R. Cano y Ca., owners; Juan G. Cano, manager. Has cupriferous and argentiferous copper ores.

COMPañIA MINERA REINA DE COBRE.

MEXICO.

Mine office: Ejutla, Oaxaca, Mex. Capitalization \$100,000, Mexican. Jas. Butler, general manager; Juan de Peza, superintendent, at last accounts. Property is the Luna de Oaxaca mine.

MINA REINA DE COBRE.

MEXICO.

Owned by La Union Consolidated Copper Co.

REINDEER COPPER & GOLD MINING CO.

IDAHO.

Office and mine: Mullan, Shosone Co., Idaho. A. M. Strode, manager. Lands, 5 claims, said to have a vein carrying a 2' paystreak of 16% to 21% copper and 3' to 6' of copper ore of concentrating grade. Has a steam plant and air-compressor.

REINDEER MINING CO.

IDAHO.

Succeeded by Reindeer Copper & Gold Mining Co.

REINS COPPER CO.

MONTANA.

Office and mine: 46 East Broadway, Butte, Silver Bow Co., Mont. J. M. Guffey, president; J. P. Reins, and Asa Childs, vice-presidents; prece ling officers, Wm. P. De Armit, Hon. John Miller, Frank J. Weixel, E. W. Marland, Geo. W. Stapleton, W. W. McDowell, E. D. Leavitt and Guy Stapleton directors; W. F. Johnson, secretary and treasurer; G. B. Thompson, assistant secretary and treasurer; Thomas Bryant, consulting engineer; John Stewart, superintendent. Organized April 27, 1903, under laws of Montana, with capitalization \$1,500,000, shares \$1.50 par.

Lands, 1 claim, formerly known as the Betsy Dahl, and later as the Combination, area 18 acres, in the Meaderville district, just east of Butte. Mine was idle 1881-1902, on account of litigation. Property is small, but valuable, being well located, adjoining the Leonard, Colusa and Minnie Healy mines, all good producers, and is supposed to carry the extension of the Leonard vein.

The Combination shaft was 1,200' deep, May, 1906, and crosscuts were being driven north and south, at that depth. It is planned to sink this shaft to 2,000' depth, but the ground is broken and wet, making sinking slow and expensive. The shaft has 2 compartments, but is to be cut down to 3-compartment size. The mine has shown some good argentiferous copper and lead ores, including chalcopyrite, assaying up to 60% copper and 200 oz. silver per ton.

Equipment includes a 240-h. p. steam plant, with a hoist good for 2,000' depth, and two 700-gallon pumps, one on the 800' level and one on the 1,200' level, also a 5-drill air-compressor. Management seems good and the property, though small, is considered decidedly promising.

RELIANCE GOLD & COPPER MINING CO.

ARIZONA.

Office: 15 Brown Palace Hotel, Denver, Colo. Mine office: Turkey, Yavapai Co., Ariz. C. S. McElrath, president; E. J. Price, vice-president; H. G. Trester, secretary; W. D. Webster, superintendent. Organized January, 1904, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Was promoted by Herbert S. Shaw. Lands, 11 claims, area 220 acres, in 2 groups, in the Big Bug district, circa 10 miles from a railroad, opened mainly by tunnel, showing auriferous and argentiferous copper ore of uncertain tenor. Idle since circa 1904, apparently with poor prospects of resumption.

RELIANCE GOLD MINING CO.

ARIZONA.

Office: care of W. C. Edgar, secretary and treasurer, Chicago, Illa. Mine office: Groom Creek, Yavapai Co., Ariz. Employs circa 75 men. C. E. Rollo, president; L. A. Davies, general manager and chairman executive board. Capitalization \$1,200,000, shares \$1 par; issued, \$800,000.

Lands, 10 claims, area 200 acres, on Hassayampa creek, 8 miles from Prescott, property being well timbered with spruce, pine, and juniper. Mine has a 350' two-compartment shaft, with circa 2,000' of drifts, on 4 levels, all in ore, with about 20,000 tons blocked out for stoping. Ores are auriferous copper and lead sulphides, associated with iron pyrites, values ranging from \$4 to \$350 per ton. Equipment includes a steam plant, with hoist good for 500' and a 6-drill air-compressor. Buildings include a boarding house, bunk-house, assay office, stable, etc.

The mill, of 50 tons daily capacity, on the banks of Hassayampa creek, has a Gates crusher, 3 sets of rolls, trommels and Hartz jigs, and under the same roof is a mill with 5 gravity stamps, hydraulic sizers, three 6' Frue vanners and 1 Standard concentrator, and a power plant with an 80-h. p. boiler and a 60-h. p. engine. Production is circa 350 tons of concentrates and 25 tons of smelting ore, per month.

RELIANCE MINING & MILLING CO.

PENNSYLVANIA.

Office: Lancaster, Pa. Mine office: Hunterstown, Adams Co., Pa.

REPUBLIC CONSOLIDATED MINING & MILLING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Thos. B. Crow, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has steam power.

REPUBLIC MINES CO.

NEW MEXICO.

Office: 526 Exchange Bldg., Denver, Colo. Mine office: Lucero, Mora Co., N. M. Felix J. Woodward, president; W. Littlefield, vice-president; Marcus Finch, secretary-treasurer.

Organized under laws of Colorado, with capitalization \$500,000, shares \$1 par. Lands, circa 7,500 acres, patented, one-half owned in fee and one-half bond and lease, opened by 5 shafts of 20' to 60' depth, and tunnels of 120', 140' and 650', showing 6% copper ore.

REPUBLIC MINING CO.

MEXICO.

Office: 1036 National Life Bldg., Chicago, Ills. Geo. F. Grove, president; W. A. Arms, vice-president; Robert J. McNabb, secretary; E. L. Bigham, treasurer.

REPUBLIC SMELTING CO.

COLORADO.

Office and works: Leadville, Lake Co., Colo. Capitalization \$500,000. Property is the remodeled 500-ton smelter, with 3 furnaces, formerly owned by the Boston Gold-Copper Co.

RESCUE COPPER CO.

ARIZONA.

Office: 8 South Sixth St., Ft. Smith, Ark. Mine office: Gila Bend, Pima Co., Ariz. Is closely connected in management with the Cornelia Copper Co., and, early in 1906, was said to be installing a reduction plant on a new system, which is fully described in the article on Cornelia.

RESOLUTE COPPER CO.

MICHIGAN.

Wound up. Lands sold, 1905, to Keweenaw Copper Co.

MINA RESTAURADORA.

ARGENTINA.

Owned by Capillitas Copper Co., Ltd.

MINA LA REVANCHA.

MEXICO.

Mine office: Ojocaliente, Zacatecas, Mex. J. Incarnacion Spina, owner; R. Spina, manager. Ores carry silver, lead and copper. Has steam power and a Chilean mill, employing about 50 men, at last accounts.

REVENUE MINING CO.

ARKANSAS, UTAH & WASHINGTON.

Office: 201 Northwestern Bldg., Minneapolis, Minn. Frank E. Plummer, president; Edwin Perry, vice-president; D. A. Simmons, secretary; Sterling Cross, treasurer. Organized 1901, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. Lands include the Revenue group, 140 acres, showing copper-gold ores, in Stevens county, Washington, also oil lands in Utah, zinc and slate lands in Arkansas, and a gas franchise for the town of Belton, Missouri. Idle.

REVENUE MINING & MILLING CO.

WYOMING.

Office: care of F. D. Russel, Denver, Colo. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Development is by two tunnels, cutting two veins giving good assay values in copper, and also carrying small quantities of gold, nickel and uranium. Idle for several years.

REWARD COPPER MINING CO.

ARIZONA.

Mine office: Vekol, Pinal Co., Ariz. Has auriferous copper ores, with steam plant, 20-stamp mill and 20-ton cyanide plant. Idle.

REWARD MINE.**CALIFORNIA.**

An old and idle mine in Plumas county, California, formerly known as the Cosmopolitan. Was a producer. circa 1863. Is opened by tunnels and shaft.

REX COBRE MINING CO.**ARIZONA.**

Office: Muskegon, Mich. Mine office: Safford, Graham Co., Ariz. Dr. B. D. King, president; J. B. Barlow, secretary and treasurer. Organized 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 20 claims, area 320 acres, in the Lone Star district, showing fissure veins, developed by a two-compartment incline shaft of 540', with 700' of underground openings. Has a 28-h. p. steam hoist. Idle at end of 1905, but planned resumption.

REX GOLD MINES & INVESTMENT CO.**COLORADO.**

Mine office: Leadville, Lake Co., Colo. Jesse F. McDonald, manager. Lands include the Rattler and Reconstruction mines, carrying gold, silver, lead and copper ores. Has steam power.

REY DEL ORO MINING CO.**MEXICO.**

Owens the Mulatos mines, in the Sahuaripa district of Sonora, Mexico. Stock issue is owned outright by the Greene Gold-Silver Co.

COMPAÑIA MINERA LOS REYES.**MEXICO.**

Mine office: Zitacuaro, Michoacán, Mex. Rafael Rodriguez Gil, manager. Has a tunnel, showing copper ore.

REYNOLDS-ALASKA DEVELOPMENT CO.**ALASKA.**

Office: 27 State St., Boston, Mass. Mine office: Valdez, Prince William Sound, Alaska. Employs 60 men. Henry D. Reynolds, president; Chas. H. Kingsbury, vice-president; Hon. John G. Brady, secretary and treasurer; Blamey Stevens, general manager; preceding officers and Hon. Eben Smith, directors; W. Bertram Hancock, mine superintendent. Organized 1903, under laws of Washington, with capitalization \$3,000,000, shares \$1 par, in \$1,000,000 cumulative 6% preferred stock and \$2,000,000 common shares; issued, \$2,088,826. On February 1, 1906, had \$105,648.48 cash on hand, without accrued liabilities. Washington Trust Co., Boston, transfer agent and registrar; Audit Company of New York, auditor. Annual meeting, approximately May 13, on call of president.

Lands, 51 claims, area 1,020 acres, also an 80-acre millsite and 6,000 acres of coal and oil lands, in several different groups, in 2 different localities, in the Valdez district. Country rocks are slate, greenstone and porphyry, showing various contact veins between slate and greenstone.

The Boulder Bay group, 23 claims, area 460 acres, on the Kenai peninsula, Prince William Sound, shows a contact vein between greenstone and slate, carrying chalcopryite, assaying 11% copper and \$3 gold per ton, opened by 2 tunnels. Equipment includes a 60-h. p. boiler and a 5-drill Rand air-compressor.

The Latouche-Iron Mountain group, 20 claims, includes the Duchesne and Blue Fox properties, on the west coast of Latouche Island, circa 60 miles west of Boulder Bay. The Blue Fox mine shows a 4' vein of 7% ore.

which it is planned to develop by shaft, topography being unsuited to tunneling. The Duchess mine, developed by tunnel, shows ore of somewhat lower grade than that found in the Blue Fox. The property on Latouche Island has a good water power available, and it is planned to install a hydro-electric power plant, with a flume and steel pipe, leading from Big Falls creek to a Pelton wheel, direct-connected to two 40-kw. generators.

The company also has a property known as the Aurora, slightly developed, but idle at last accounts. Management was said to be installing a 100-ton concentrator at its mine, equipment including a Gates crusher, 2 sets of rolls, 2 Huntington mills, 8 Frue vanners, and amalgamating plates, but no reference to this mill is made in the last report of the company. Present equipment includes a 60-h. p. steam plant, at the Boulder Bay property, and a 100-h. p. steam plant, at the Latouche-Iron Mountain group. It is planned to build a 150' shipping wharf, at Boulder Bay, and it is hoped to begin regular shipments from this property during the summer of 1906. Management seems good, and property is considered promising.

REYNOLDS MINE.**VERMONT.**

Mine office: South Strafford, Orange Co., Vt. Property adjoins the Elizabeth mine. Idle for several years.

RHODE ISLAND COPPER CO.**MICHIGAN.**

Office: 32 Broadway, New York. Mine office: Boston, Houghton Co., Mich. Employs about 25 men. Wm. R. Todd, president; preceding officer, Isaac H. Meserve, Henry A. Wyman, C. J. Devereaux, Daniel T. Brigham and Jas. S. Dunstan, directors; W. A. O. Paul, secretary and treasurer; M. M. Dennis, superintendent. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$600,000.00
Amount paid in by conveyance of property.....	300,000.00
Entire amount invested in real estate.....	300,000.00
Amount of personal estate.....	47,130.89
Amount of floating debt.....	2,901.57
Amount due company.....	12,500.00

Lands, 800 acres, north of the Franklin Junior.

No. 1 shaft, 275' north of the Franklin Junior boundary, is 8x18', with 3 compartments, 500' deep, sunk on the Pewabic amygdaloid, which is 8' to 10' wide, with 2' to 3' near the hanging wall well mineralized, at points. This shaft, abandoned 1902, is filled with water to the first level, on which it connects with No. 2.

No. 2 shaft, 1,200' next north, also is 8x18' in size, and is circa 1,300' deep, having a frame shafthouse and Nordberg hoist capable of raising 2-ton skips from 1,000' depth. A crosscut, driven 180' east, encountered the Allouez conglomerate in March, 1903, and drifting on that lode was continued until July, 1904, when stopped, owing to lack of favorable ground. No. 2 shaft has crosscuts both east and west. The east crosscut, on the eighth level, at

a depth of 1,000', cut two apparently valueless amygdaloids, one being the Mesnard epidote. The East lode, about 5' wide, carries a little copper, but nothing especially encouraging. The West lode, 96' from the shaft and 7' to 9' wide, carries considerable copper in bunches. The four amygdaloids lying between the West lode and the Allouez conglomerate have been tested by drifting north and south, three proving barren. Principal work of 1904, and the first 8 months of 1905, was on the Pewabic and West lodes. Latter was opened by crosscuts on the 8th and 9th levels, showing occasional encouraging ground. A 1,400' drift on the 8th level north showed occasional patches of payable ground of 25' to 75' length, on the Pewabic amygdaloid. The north drift on the 8th level was discontinued at 150' and the north level on the 10th level was stopped at 300', after showing some improvement.

A new shaft, known as No. 3, was started, 1,800' north of No. 2, in May, 1905, but work was discontinued at slight depth, and attention turned to the Kearsarge lode. Diamond drilling to locate the Kearsarge bed was begun November, 1905. The first cores showed copper in encouraging quantities, from a bed of circa 19' width. The Kearsarge must underlie practically the entire tract, and the future of the property rests, apparently, upon finding it to carry copper in workable quantities.

Surface improvements include a 30x60' machine and blacksmith shop, a 30x50' frame warehouse and supply office, and 15 dwellings. No. 2 engine house has a 12-drill Rand air-compressor, operating 2 power drills.

RHODESIA COPPER CO., LTD.

RHODESIA.

Office: Salisbury House, London, E. C., Eng. Lord Gifford, chairman; Bechuanaland Exploration Co., Ltd., manager in South Africa; T. G. Davey and Percy Tarbutt & Co., consulting engineers; Tom Donald, secretary. Organized January 31, 1902, with capitalization £750,000, shares £1 par. Has floated the Rhodesia Broken Hill mine, a zinc and lead property, and paid a 10% dividend to shareholders, 1905, in the stock of that company.

Lands, 640 square miles, and the right to locate 8,000 mining claims and 33 farms, in northern Rhodesia, of which 5,665 mining claims and 24 farms have been located. Company has a close working alliance with the Northern Copper (B. S. A.) Co., Ltd., and apparently both companies have some sort of claim to the Bwana M'Kubwa and Hippo mines, which are described in the article on Northern Copper. The Kitakata mine, $\frac{1}{2}$ mile northeast of the Broken Hill, shows stains and hand-specimens of oxides and carbonate copper ores.

RICHARD III DEVELOPMENT CO., LTD.

BRITISH COLUMBIA.

Office: Duncans, B. C. Mine office; Mt. Sicker, Vancouver Island, B. C. Lands lie east of the Tyee and are opened by a 510' two-compartment shaft, with 2,181' of workings on 5 levels, giving ore on each level. Best ore is on the bottom level, a sample ton smelted giving returns of 3.29% copper, 25.85 oz. silver and 0.66 oz. gold per ton. Property considered promising, but idle since 1904, owing to lack of capital.

RICHFIELD MINING CO.

MEXICO.

Office: Mears Bldg., Scanton, Pa. Mine office: Querobabi, Ures, Sonora.

Mexico. Employs 30 men. Dr. S. T. Haffner, president; Maj. Jas. A. Cooper, vice-president; Dalbys L. Fickes, secretary and treasurer; W. D. Fredericks, general manager; Epifanio Mungaray, mine superintendent. Organized May, 1901, under laws of Arizona, with capitalization \$5,000,000, shares \$2 par; issued, \$3,200,000. Bonds, \$100,000, at 6%. Cash on hand, March, 1906, was \$30,000.

Lands, 382 pertenencias, area 955 acres, in 2 groups, circa 12 miles from Tuape, and 35 miles from the Sonora railway, also 26,512 acres of timber lands, in the Ures district. Country rocks are granite and limestone, carrying 7 contact veins, of 16' to 40' estimated average width, opened by shafts of 73' and 75', and by tunnels of 48' and 60', showing carbonate and oxide ores and chalcopryrite, assaying 3% copper and 20 oz. to 60 oz. silver per ton, with small gold values. Property shows more or less antigua workings.

Early in 1906 the company was installing a 120-h. p. steam plant, with two 20-h. p. hoists, good for 600' each, and a 4-drill air-compressor. Several mine buildings have been constructed. Company has suffered from lack of cash in the past, but is said to have passed under the management of financially responsible people, and active development and the building of a 50-ton concentrator are contemplated.

RICHMOND-EUREKA MINING CO.

NEVADA.

Mine office: Eureka, Eureka Co., Nev. Albert Fries, president; W. H. Coolidge, vice-president; A. J. Seligman, treasurer; A. F. Holden managing director; A. P. Mayberry, mine superintendent. Organized October, 1905, under laws of Maine, with capitalization \$3,600,000, shares \$10 par, succeeding the Eureka Consolidated Mining Co. and the Richmond Mining Co. Is controlled by the United States Smelting, Refining & Mining Co., and stock is pooled in a 5-year voting trust, with A. F. Holden, B. Naumberg and Albert Fries, trustees.

The Richmond and Eureka mines are contiguous properties, opened circa 1869, and are said to have produced \$75,000,000 in ore values, above the water-level, but this probably is an overestimate. Properties were tied up by litigation, for some years, until recently, during which time considerable scrambling was done, by tributors. The ores carry an excess of iron and should be valuable for fluxing the Utah ores of the United States company. Mines have railroad connections. The smelter, at Eureka, 3 miles from the mines, is antiquated in design and equipment, and has been idle for some years.

RICHMOND GROUP GOLD MINES CO.

NEW MEXICO.

Office: Board of Trade Bldg., Boston, Mass. Letter returned unclaimed from former mine office, Hillsboro, Sierra Co., N. M. Ores carry gold and copper. Has steam power.

RICHMOND MINE.

MONTANA.

Mine office: Saltese, Missoula Co., Mont. Chas. J. Heidenreich, manager. Lands, 6 claims, southwest of Saltese, adjoining the Monitor mine, opened by a 275' shaft, showing considerable native copper and ores assaying up to \$60 per ton, in copper and gold values. Property has been a producer, in a small way, for some years. and is said to have been worked at a profit.

RICHMOND MINING CO.**NEVADA.**

Merged, 1905, in Richmond-Eureka Mining Co.

RIGBY MINING & REDUCTION CO.

Office: care of F. H. Walker, secretary and treasurer, Beaver Falls, Pa. Works office: Mayer, Yavapai Co., Ariz. Col. T. Johns Rigby, president and general manager; preceding officer, R. D. Mead, L. S. Neely and Edward C. Fink, directors; Harry A. Clarke, superintendent. Lands, 70 acres, near Mayer, being a smelter-site, connected by a 3,000' spur line with the Prescott & Eastern Railway.

This company holds the Yavapai county rights to the Poehle & Crossland volatilization process, and has a 125-ton reduction plant, blown in, April, 1906. The process of reduction is as follows: from the receiving bins, ore is taken in tram-cars to 2 revolving dryers, one of 40' diameter by 18' length and the other of 60' diameter by 26' length, heated ore passing from them, by gravity, to cars, which take it to the feed-hoppers in the roll-house, latter having 3 sets of 30x14" rolls and 1 set of 20x12" rolls, with screens and elevators. Dust from rolls is collected by 3 large dust-collectors. Crushed ore is taken from the screens to a 40-ton ore-bin in the mixing-house, by an 84' automatic belt-conveyor. In the mixing-house, ore and salt from the salt-bins are weighed by 2 sets of hopper scales, and deposited on a 50' belt-conveyor, which takes the material to a box-mixer, whence the mixed charge is dumped into a car which takes it to 4 feed-hoppers, which feed the charges automatically to revolving furnaces, in a furnace building 88x132' and 40' high, having four 25-ton revolving calcining furnaces. Fumes from the ore are drawn from the furnaces through the flue-house, which contains 4 sets of 3' wrought-iron pipe, each 175' long, into the condensing house, by 4 large blowers, each capable of handling 6,600 cubic feet of gas per minute. Fumes are cooled by water, in the flue-chamber, then forced under pressure into the condensing room, where deposited as chlorides, condensing-room fumes going to the filtration room, where all insoluble matter is filtered, and where metallic values are precipitated, either by electric action, or on iron. Precipitates are melted and refined in the ordinary manner. The residue of the roasted ore, from which the metallic values are supposed to have been volatilized, is carried to the tailings dump, in tram-cars. The theory of the process is that the application of heat to the mixture of ore, salt and sulphur, causes a chemical reaction, by which the sulphur and sodium chloride form sulphate of soda, the chlorine from the salt uniting with the metals to form chlorides, which pass off in the fumes, and are recovered in the manner previously explained.

RILLITO MINING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Tucson, Ariz.

RINCON MINING CO.**ARIZONA.**

Office: care of B. J. O'Reilly, secretary, Bisbee, Ariz. Organized under laws of Arizona, with capitalization \$2,500,000, shares \$25 par. Lands, 27 claims, 22 miles north of Benson, Cochise county, Arizona, developed by a 130' tunnel, showing ore giving assays up to 23% copper.

RINGING ROCKS COPPER MINING CO.**PENNSYLVANIA.**

Mine office: Pottstown, Montgomery Co., Pa. Idle.

RIO ALTO COPPER CO.**COLORADO.**

Capitalized at \$1,500,000, shares \$1 par, equally divided into 8% preferred and common stock. H. M. Comstock, general manager. Lands, claimed to be 300 acres, in Northwestern township, Custer county, Colorado. Company claimed to have 3½ miles of underground workings, and to be building a 50-ton reduction plant, but neither statement verified, nor likely to be.

RIO ARriba CONSOLIDATED MINES CO.**NEW MEXICO.**

Letter returned unclaimed from former office, Milwaukee, Wis. Mine office: Tres Piedras, Taos Co., N. M.

RIO DOLORES COPPER CO.**UTAH.**

Office: 731 East 18th Ave., Denver, Colo. Mine office: Castleton, Grand Co., Utah. Employs 20 men. Fred G. Shaffer, president; Victor A. Elliott, vice-president; Thos. B. Crawford, secretary, treasurer and general manager; Will Eastman, superintendent; Walter Mitchell, engineer. Organized February 1, 1906, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par; issued, \$1,750,000. Statement, as of date March 19, 1906, gives cash on hand, \$37,500. Annual meeting, first Thursday in July.

Lands, 15 claims, area 300 acres, also 100 acres in millsites, in the La Sal district, showing granite country rock, with porphyry intrusions, carrying 12 ore bodies, of which 2, slightly developed by 100' of tunnels, are of 30' estimated average width, showing ores estimated to carry average values of 2% to 3% copper, 10 oz. silver and \$3 gold per ton. Equipment is to include a 5-drill air-compressor and 6 log buildings. The company plans driving a 500' tunnel.

SOCIÉTÉ MINES DE CUIVRE ET DE PLOMB**SPAIN.****DE RIO FARDIS.**

Mine office: Molinillo, Ciudad Real, Spain. Organized August, 1903, under laws of France, with capitalization 2,500,000 francs, shares 250 f. par, to develop argentiferous lead and copper properties, near Molinillo.

COMPAÑIA MINERA RIO GRANDE y DOLORES**MEXICO.****DE LONDRES.**

Offices: 37, Old Jewry, London, E. C., Eng. Mine office: Guadalupe, Guerrero, Mex. A. R. MacSwinney, manager. Operates La Nave mine, producing silver and copper. Has steam and water power, concentrator and leaching plant, employing about 40 men, at last accounts.

RIO GRIO DISTRICT COPPER CO. (TOBED &**SPAIN.****CODOS EXPLORATION), LTD.**

Offices: 12, Lime St., London, Eng. J. Paul, Vicomte de Lassus, chairman; A. Fougere, consulting engineer; A. L. Lanseigne, secretary. Organized Oct. 30, 1903, with capitalization £130,000, shares £1 par; issued, £97,987. Lands include 14 properties in the province of Zaragoza, Spain. Presumably idle.

RIO HONDO COPPER CO.**NEW MEXICO.**

Dead. Property sold, circa 1900, to San Cristobal Copper Co.

RIO LUNA MINES CO., LTD.**SPAIN.**

Offices: care of J. N. Derbyshire, secretary, Nottingham, Eng. Mine office: Campo La Lomba, León, Spain. Edward H. Pares, president. Capitalization, £120,000. Lands, 135 hectares, including the Riello mine, carrying auriferous and argentiferous copper sulphides. Idle for some time.

RIO NEGRO MINES LTD.**SPAIN.**

Offices: 6, Suffolk St., Pall Mall, London, S. W., Eng. Mine office: Campo La Lomba, León, Spain. Alfred DuCros, chairman; W. T. Cunningham, secretary. Organized Aug. 2, 1899, with capitalization £250,000, shares £1; issued, £235,007. Debentures, £15,000 authorized; £14,000 issued. Lands, 8 claims. Presumably idle.

RIO RIMAL COPPER CO., LTD.**SPAIN.**

Offices: 17, Fenchurch St., London, E. C., Eng. Mine office: Figueras, Gerona, Spain. Organized, July 18, 1900, as Afortunada Copper Mines, Ltd., name changed, 1903, to present title, with capitalization £75,000, shares £1 par. Lands, area circa 12 hectares, known as the Afortunada mines, held on perpetual lease from the Spanish Crown, at a rental of 236 pesetas yearly, plus 2% royalty on production. Receiver and manager appointed, August, 1905.

RIO TENIDO COPPER MINES, LTD.**SPAIN.**

Voluntarily liquidated, April, 1903.

MINAS DE COBRE DE RIO TINTO.**MEXICO.**

Mine office: Terrazas, Chihuahua, Mexico. Employs 350 men. David Goodale, general manager; W. W. Marion, superintendent; H. Schenider, smelter superintendent. Property is owned by Juan A. Creel, of Chihuahua, and is under lease to Messrs. Frank Fletcher, David Goodale, W. W. Marion and Juan A. Creel. Lands, 50 pertenencias, near Terrazas, 25 miles north of the city of Chihuahua, on the Mexican Central Railroad. Mine was opened 1840, and has worked at different times since, with varying fortunes, producing considerable copper, but was practically closed down, since circa 1901, until taken over by present operators, September, 1905. Country rock is limestone, showing several veins, occurring as fissures in limestone, or as lenses between the bedding planes of limestone, near a large intrusive dike of quartzite. Ore bodies are erratic in size and occurrence, but are connected and practically continuous, as a rule. The lime has an average dip of 45° to the northwest, showing 5 or 6 ore bodies, of 5' to 50' width, and 5' to 150' length, with unknown depth. The ore bodies are low in grade, but the deposits are extensive. Property shows a little sulphide ore, but mainly oxidized ores of estimated average value of 4% copper, 5 oz. silver and 20 cents gold per ton.

Development is by about 1 mile of tunnels, and by numerous pits of 50' or less in depth, with 6 shafts as follows: Promontorio, 350'; Verde, 400'; Perdernal, 120'; Bronce, 150' and Vinagre, 100'. The mine has a total of about 2 miles of underground workings. A reported strike of 3% nickel ore was a false alarm, as no such ore was found. Equipment includes 6-h. p. and 16-h. p. hoists, good for 400' depth, a concentrator, sundry adobe mine buildings and 120 dwellings for workmen.

The smelter, $\frac{1}{2}$ mile from the mine, receiving ore by carts, has a 150-ton water-jacket blast-furnace, turning out matte averaging 50% copper, 40 oz. silver and 0.3 oz. gold per ton, sent for refining to the Aguascalientes plant of the American Smelting & Refining Co. The smelter also does a general custom business, and is reached by a switch from the Mexican Central railway, the main line of which is only 1 kilometer distant. Water is secured by a 4" pipe-line of circa 1 mile length, with a pump station. Mine fuel is wood, costing \$7 per cord, and coal, costing \$13 per ton, and the smelter burns coke, costing \$19 per ton. Management plans sinking until sulphide ore and water are found, and also plans installing new and larger hoists, adding new boilers, erecting sundry mine buildings and enlarging the smelter.

Production was begun January 31, 1906, and for February the product was 60 tons fine copper, estimated by management, to be made at a cost of 5 cents per pound, gold. In March, 1906, the smelter was treating circa 160 tons of ore daily. The Rio Tinto Mexicana is a mine of undoubted value. The ore, while low in grade, exists in large quantities, and the property is favorably located for operation. The present management is experienced, and should make a considerable producer of the mine.

RIO TINTO CO., LTD.

SPAIN.

Offices: 30, St. Swithin's Lane, London, E. C., Eng. Mine office: Las Minas de Rio Tinto, Huelva, Spain. Employs circa 11,000 men. Chas. Wm. Fielding, chairman; preceding officer, Maj.-Gen. Sir Arthur E. A. Ellis, G. C. V. O., C. S. I., Lionel C. G. Sartoris, John M. Macdonald and John MacFarlan, directors; J. Gordon Macleod and Samuel J. Bowes, joint secretaries; Duff, Bruce & Co., British consulting engineers; D. Gonzalo Tarin, Spanish consulting engineer; Turquand, Youngs & Co., auditors; Commercial Bank of Scotland, Ltd., bankers; Freshfields, solicitors; W. A. Carlyle, general manager; R. E. Palmer, assistant manager; W. G. Nash, estate manager; G. W. Porteous, traffic manager; George Davey, superintendent; Gordon Douglass, engineer.

Organized March 29, 1873, with capitalization £3,250,000, increased November, 1905, to £3,500,000, shares £5 par, in £1,625,000, cumulative 5% preference shares and £1,875,000 ordinary shares. The new issue of 50,000 ordinary shares, £5 par, was sold to shareholders at £63 per share, netting the company £3,150,000, for the redemption of an outstanding bond issue of £3,065,300, in 4% debentures. Transfer form, common; fee, 2s. 6d; warrants to bearer issued in denominations of 1 share, fee 6d., and 5, 10, and 25 shares, fee 1s.; fee for conversion into registered shares, 2s. 6., per certificate. Stock Exchange settlement, all shares quoted in the official list. Fiscal year ends with the calendar year, and accounts are submitted in April, and an interim semi-yearly report is issued in October.

Dividends are payable in Paris by the Société Générale, 54, Rue de Provence, and in Bremen, Germany, by the Deutsche Bank. Dividends were begun 1879, and have been paid each succeeding year, varying greatly, according to net earnings. Dividends on the old ordinary £10 shares, from 1879 to 1896, inclusive, ranged from 6 shillings in 1886 to 38 shillings in 1896.

- On the present £5 ordinary shares dividends have ranged from 40% in 1897 to 85% in 1900. Dividends have been as follows, on the ordinary shares, for the past 5 years; £3 12s. 6d., or 72½%, for 1901; £2 10s., or 50%, for 1902; £3 10s., or 70 %, for 1903; £3 10s., or 70%, for 1904; £4, or 80%, for 1905. Dividends were small at first, because the company was seriously handicapped by three different sets of mortgage bonds, bearing 5% interest. In 1895 the mortgage debt was consolidated into a single issue of £3,600,000 first mortgage debentures, bearing 4% only, with a sinking fund and semi-annual redemption, which would have extinguished the mortgage in 1919. By the issue of new share capital, in November, 1905, floated at the tremendous premium of 1,260%, the company has placed itself in an impregnable financial position. The credit for this clever and altogether commendable stroke of finance is due mainly to Mr. Fielding, the chairman of the company.

The following table gives a financial summary for three years:

	1901	1903	1905
Gross Profits	£1,811,150	£1,691,723	£1,589,190
Dividends Paid	1,254,805	1,214,687	1,477,187
Reserve and Depreciation	140,954	102,452	74,370

The company ended 1905 with a reserve fund of £500,000, of which £400,000 was in Consols.

Lands, 23,000 acres, freehold, of which 1,922 hectares, equal to circa 4,700 acres, were secured from the Spanish government, and 18,300 acres adjoining were purchased from various private owners. Mining operations are conducted in an area of practically 5 square miles.

The Rio Tinto is much the most ancient of the great mines of the present day, and its history stretches back into the mists of antiquity. The first semi-authentic account of the mine dates from the Eleventh Century before Christ, when the Phœnicians traded in copper made from its ores. Carthage, that vigorous young offspring of Tyre, succeeded to the hegemony of the Iberian mines, and worked the Rio Tinto extensively, for several centuries, being displaced, in turn, by the Romans, after the repulse of the second Punic invasion, followed by the total overthrow of the Carthaginian power. The Rio Tinto was worked by the Romans, for centuries, upon a very considerable scale, and, after the decadence of the Roman power, the mines were operated, after a fashion, by the Goths. Again the fortunes of war gave the Iberian peninsula to new masters, and the Moors, in turn, were owners and operators of this great copper deposit. Following the expulsion of the Moors from southern Spain, by Ferdinand and Isabella, those most Catholic and most warlike sovereigns of Castile and Aragon, the mines fell into the hands of the Spaniards, and were reopened by them very early in the Sixteenth Century. The Spanish, while among the world's best miners, and the pioneers of silver and gold mining in both North and South America, never paid close attention to copper or iron, and even at home, the Rio Tinto, although the property of the Spanish Crown, was worked, during its most successful periods, by foreigners, as it is to this day. In the Seventeenth Century the mine became a considerable producer, under the management of a Swede named

Wolters, and after his death did fairly well under the direction of a French metallurgist named Tiquet. In the Eighteenth Century the mine was leased by the crown to a company of English adventurers, of whom the leading spirit was Lady Maria Theresa Herbert. During the chaotic period of the French invasion, early in the Nineteenth Century, the mine was abandoned, and after being reopened, in 1812, by the Spanish Crown, was worked in a small way only. For the next sixty years the mine was under the management of various lessees, until sold outright, in 1873, to Matheson & Co., of London, for 92,800,000 pesetas, that firm organizing the present company, which has proven one of the most profitable mining corporations in existence.

The remains of mining and smelting operations of the ancients are very notable. Don Gonzalo Tarin, Spanish consulting engineer to the Rio Tinto Co., Ltd., who has been closely connected with the mine since 1867, a period of forty years, in his very able work, "*Memorias*," estimates the quantity of scoria remaining from ancient smelting operations, whether Roman or Phœnician, or both, at no less than thirty million metric tons, and his acquaintance with the property and its history, and his opportunities of estimating and verifying these figures, are perhaps the best of any individual living. Lying above slag-piles left by the Phœnicians is a 10' bed of alluvium, on top of which are the Carthago-Roman slags. The smelting practice of the Romans apparently was very good, the slags left by them being as clean as those produced today. It is possible, however, that some of the copper left in the old slags has been leached out, during some 2,000 years of partial exposure to the elements, but it is the opinion of Señor Tarin that the slags have been resmelted, in which case the very latest modern metallurgical practice is but a repetition of the work of two thousand years ago.

The only remains of ancient mining tools and machinery that have been found at the Rio Tinto are three water-wheels, of oak, and some bronze rims of kibbles, which presumably were of wickerwork. There also are many potsherds, including fragments of miners' lamps of the well-known classic pattern, and occasional Roman coins are unearthed.

The Roman system of mining, so far as can be judged from the evidence offered by the Rio Tinto mine, apparently was to cut narrow seams and slab off the ore in large masses, either by wedging, or by the agency of quicklime, tamped into the crevices and then wetted, and possibly both methods were used, these being the plans most generally used previous to the adoption of gunpowder for blasting. The richer veins were followed persistently, and the ancients were good judges of values, as has been learned by many a modern mining company that has reopened old mines in Spain and Italy, in the hope of finding that much high-grade ore was left unmined—in which cases disappointment is almost certain to be met with. The Rio Tinto was not worked out, because the deposit was too vast, but the rich ores of the secondary zone of enrichment were quite effectually gouged out, in all the old workings. Indications favor the hypothesis that the ancient miners at the Rio Tinto used hard-faced tools and hand-drills, working directly on the faces and in the ore bodies.

The Rio Tinto is situated in a rugged district, in a spur of the Sierra Andevallo, though the hills sometimes are held to be a spur of the Sierra Aracena, which is itself a branch of the famous Sierra Morena. The Rio Tinto, however, is separated from the Sierra Andevallo, which is some 12 miles distant, by the rivers Odiel and Iárrama. Mines are 51 miles by rail inland, from the seaport of Huelva, in the province of that name, lying in the extreme southwestern corner of Spain, near the Portuguese boundary.

The ore bodies of the Rio Tinto occur in mammoth masses, with clay-slate on the south and porphyry to the north, and are surmounted by immense gossan cappings, much decomposed, and easily broken for removal. The surface ore has been leached to the point of absolute worthlessness, the zone of secondary enrichment beginning at a depth of approximately 100', and continuing to an average depth of circa 300'. The ores in this zone are of a materially better grade than those found below. The mine has three veins, or mineral zones carrying successions of lenses, these being known as the South, or Nerva lode, the Middle or San Dionisio lode, and the North lode, in addition to which there are two smaller detached lenses, adjacent to the North lode, which, like it, are being worked open-cast. There are five different mines, of which three are worked open-cast and two underground. The latter are worked pillar-and-stall, with levels every $12\frac{1}{2}$ metres, levels being opened 4 metres high, and the entire floor divided into galleries and crosscuts of 4x4 metres, leaving pillars of 6x6 metres, which seems a rather ineffective method. The deepest shaft, nearly 1,200', is in the San Dionisio mine, on the Middle vein, this being the westernmost shaft also. The principal workings are open-cast, and in these the capping is sliced down in terraces, and the ore mined in terraces also, cars being brought in by locomotives to as great a depth as practicable, both in stripping and quarrying. The possibility of using the caving system for underground mining has been considered. The principal disadvantage of underground mining is the scarcity and high price of wood, which could be obviated by the adoption of the caving system. Diamond drill borings show untouched ore bodies of upwards of 130,000,000 gross tons, giving sufficient reserves for nearly 70 years' production, at the present rate of mining, and it is not likely that the full extent of the ore bodies available has been proven. Upwards of 1,000,000 cubic metres of overburden are stripped per year, normally, and in 1905 stripping amounted to 1,809,969 cubic metres.

The ores carry an average of 1.5 oz. silver per ton, with traces of gold, and considerable silver is saved by the Claudet process, at the smelter. The ores are rich in sulphur and are assorted into three classes, of which the smelting ore carries 4% to 6% copper, the export ore about 3.5% copper and 45% to 50% sulphur, and the leaching ore 1.75% to 2% copper only. The average percentage of copper carried by the ores treated has ranged from 1.5% in 1876, the first year of production, to 3.234% in 1884, the average of copper extraction being 2.39% in 1903 and 2.34% in 1905, the tendency being downward. About half of the ore produced is smelted, the balance being leached, or sent abroad to burners, and about one-third of the total product is

exported for the sulphur content. The ores average 4% to 5% copper, in the zone of secondary enrichment, and gradually decline in value, with depth, until, at about 1,000', the average is only about 1.25%. The main ore body is chalcopyrite, sparingly disseminated in massive iron pyrites, rich in sulphur. Reserve heaps at the mine were estimated, at close of 1903, to contain 147,685 long tons of fine copper. The copper output of the mine has shown little change since 1898. Owing to the richness in sulphur, the shipping ores of the Rio Tinto are in good demand, and in addition to supplying various British works, are exported to Germany, France, Belgium and sundry seaboard acid works of the United States. The bulk of the medium-grade ore is shipped to the company's works in Wales, where it is burned for sulphur, and the cinder treated by the Henderson wet process, for the extraction of copper. Production of the mine is divided into approximately 60% of blister copper, from smelting ores, and 40% of copper secured from the residue of ores shipped to various sulphur-burners.

Owing to the system of mining and reduction followed by the Rio Tinto, the mechanical equipment of the mine is not especially extensive, and there are none of the immense hoists and powerful machinery found at the other great copper mines of the world. This is due, not to lack of enterprise, but to the fortunate fact that much of the production is won open-cast, while the underground workings are neither deep nor extensive. Two new hoists were added, in 1905. The methods of lixiviation followed by the Rio Tinto are given at length in the chapter on metallurgy. In addition to the amount of copper estimated to be carried in the teleras, or primary leach-heaps, there are upwards of 100,000 long tons of copper in the tereros, or secondary leach-heaps. Owing to the alteration of heavy rainfalls with protracted seasons of drought, water storage is necessary, large dams having been constructed for that purpose. The ore leached at the mines is no longer calcined, the copper becoming soluble by natural weathering, assisted by systematic sprinkling, and scrap-iron, formerly used for precipitation, has been superseded by pig-iron from Bilbao. About 7,000,000 gallons of leach-water, strongly charged with copper in solution, are treated daily in the lixiviation plant.

The smelting plant at the mine, blown in 1902, has two 42x160" elliptical water-jacket cupolas, 23' 4" over all in height, with charging doors 10' above the bottoms, which are detachable and mounted on wheels. Each furnace has 8 water-jackets and 2 charging doors, ore and fuel being charged alternately. The furnaces discharge continuously into 30-ton settlers, 12' in diameter and 40" high, which have continuous slag discharge. The matte, running 29% to 34% in tenor, is taken in 8-ton ladles, by electric traveling cranes, to the converters, there being 6 stands, rotated hydraulically from an elevated platform, with 80x120" shells, of horizontal barrel type, with spherical valves and 12 tuyeres each.

The shells are in two parts, for convenience in lining, and are double-lined with a 4" external course of fire-brick, rarely replaced, and an inner section, 22" to 26" thick, of ground silica and low-grade quartzose copper ores, with 10% of clay for a binder. When newly lined the shells have a capacity

of only 3 to 4 tons each, increasing to about 8 tons when the inner linings are nearly burned out. The smelter product is shipped as converter bars, being blister copper of 98% to 99% fineness, and the product of the lixiviation works is "cascara," or cement copper.

The mines are connected with the sea-port of Huelva by the Rio Tinto-Huelva railway, a single-gauge line 84 kilometers, or 51 miles, in length, built by the company, in 1873. This line does a general freight and passenger business, in addition to handling the company's heavy traffic, and earned net profits of £14,694 in 1901, while the 1905 business was heavier than ever previously. At Huelva, which probably is built on the site of the old Phœnician city of Onoba, at the junction of the Tinto and Odiel rivers, known to the Phœnicians and Carthaginians as the Urium and Anas rivers, the company has extensive railway terminals and wharves, the latter recently remodeled and enlarged, while further improvements are contemplated. The Rio Tinto company owns the steamer *Don Hugo*, of 1,249 tons registered burden, plying between Spain and Wales.

The Rio Tinto employs nearly 1,100 men, in Spain, of which number, about 60 members of the staff are British, the balance being native workmen the latter earning average wages of 15 reals, equal to about 60 cents, per day of 8 and 9 hours. There is no Sunday work and the men are paid daily, the labor being docile and giving very efficient and satisfactory workmen, in all grades. The population of the dual mining township of Rio Tinto-Nerva is about 27,000, and of the port of Huelva 24,000, hence it is estimated that the Rio Tinto Co., Ltd., is the direct source of support of 50,000 people in Spain, and indirectly supports perhaps half as many more in Spain, England and upon the Continent.

The company has maintained extensive smelters and acid works at Cwm Avon, Wales, for many years, but the old furnace-bottoms and rich slags at this plant are being resmelted, and the works cleaned up, preparatory to surrendering the lease, during 1906. New and more modern reduction works and acid plants have been built at Port Talbot, and will become the only works of the company, receiving ores direct from Spain.

Extraction of ore, 1905, was 627,366 long tons of cupriferous pyrites for shipment, and 1,202,768 long tons of ore for local treatment, a total of 1,830,104 tons, compared with 1,948,819 tons in 1904. The sales of washed ore disposed of for sulphur contents amounted to 308,000 long tons, in 1905, as against only circa 100,000 tons in 1903, this branch of the business showing a gratifying gain, that promises to prove permanent. Operations, during 1905, were hampered by a severe drought, causing a serious scarcity of water, indispensable in the leaching operations of the company, and 1906, because of a meager rainfall in the winter, is another year of aridity. Both years will show a reduced production of cement copper, but the balance will be restored later, none of the copper being lost, lack of water merely retarding the slow process of wet extraction. Production, 1905, was 72,307,200 lbs. fine copper, somewhat under normal, and 1906 will be low also, for the reason already given.

The management of Rio Tinto is excellent in all respects, the physical

handling of the mines and works being equal to the ability shown in the conduct of the company's finances. The mine scarcely requires commendation from a work of reference that was born in the Twentieth Century, for the Rio Tinto has been making copper for three thousand years, and the original expert who told King Hiram that the property was "merely a surface pocket, and would pinch out at little depth"—for such "experts" doubtless have existed since the Pharoahs began mining and smelting the metal—has filled an unhonored grave for lo, these thirty centuries.

RIO TINTO COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Organized September, 1902, under laws of Wyoming, with capitalization \$1,000,000, by residents of Encampment, Wyoming, and Lincoln, Nebraska.

RIO TINTO GOLD & COPPER CO.**ARIZONA.**

Office: Grant Bldg., Los Angeles, Cal. Mine office: Prescott, Yavapai Co., Ariz. E. P. Thom, secretary; A. J. Varney, manager. Lands, 16 claims, in the Black Hills district, opened by two 70' shafts, showing ore giving assays up to \$15 per ton. Idle and reorganization rumored.

COMPAÑIA MINERA DE RIO TINTO MEXICANA.**MEXICO.**

Succeeded by Minas de Cobre de Rio Tinto.

RIO TINTO MINE.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Beasley Camp, via Nelson, Kootenay district, B. C. A prospect, 7 miles west of Nelson, said to show sulphide ores carrying assay values of about \$10 per ton. Idle for several years.

RIO VISTA GOLD & COPPER MINING CO.**CALIFORNIA.**

Office: 25 Nevada Blk., San Francisco, Cal. Mine office: Fair Play, El Dorado Co., Cal. E. F. Colgan, president; D. E. McKinlay, vice-president; F. H. Hood, secretary and general manager; A. G. Burnett, treasurer. Organized January, 1901, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par.

Lands, 2 patented claims, area 40 acres, known as the Consummes mine, on the Consummes river, 3 miles from Fairplay, opened by a 400' shaft, showing a 23' vein carrying a 4' paystreak of bornite, giving average assays of circa 15% copper and \$10 in combined gold and silver values per ton. Mine has about 500' of tunnels, the Volcano tunnel showing a 10' vein carrying bornite, and a 400' shaft having a steel gallows-frame. Equipment includes an air hoist and a 3-drill Rix air-compressor, using baby drills. Management plans a new dam and flume, to utilize water power, under a 250' head, for a hydro-electric installation. Company was said to be building a 30-ton smelter, but same does not seem to have materialized. Property was idle, November, 1905, but management planned resuming work in the spring of 1906. Management is said to be composed of men of good standing, but apparently the company suffers from financial debility.

RIP VAN WINKLE MINE.**WYOMING.**

Office: care of Dr. I. R. Swigart, Laramie, Wyoming. Lands are in Carbon county, Wyoming.

RISING SUN COPPER MINING & SMELTING CO. NORTH CAROLINA.

Letter returned unclaimed from former office, 241 Equitable Bldg., Baltimore, Md.

E. RIVEROLL CO.**ARIZONA.**

Office: Los Angeles, Cal. Works office: Chloride, Mohave Co., Ariz. At last accounts was building a small copper matting furnace, for custom smelting.

RIVERSIDE COPPER CO.**ARIZONA.**

Letters returned unclaimed from former office, Phoenix, Ariz., and former mine office, Morristown, Maricopa Co., Ariz. J. M. Graybill, president; Isaac T. Stoddard, agent. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 2 patented and 6 unpatented claims, in the Vulture Mountains, showing self-fluxing carbonate ores. The Copper Bottom claim also shows a good body of slightly argentiferous galena. Moribund.

ROBLES GRANDE GOLD & COPPER MINING CO.**NEVADA.**

Letter returned unclaimed from former mine office, Goldfield, Esmeralda Co., Nev. Capitalization \$300,000, shares \$1 par. Lands, 6 claims, circa 5 miles east of Goldfield, opened by a 53' shaft, said to show a 33' vein, giving assay values of \$4 to \$32 per ton.

ROB ROY MINING CO.**UTAH.**

Office: care of Edward McGurrin, secretary and treasurer, Salt Lake City, Utah. Emanuel Rauch, president. Capitalization, \$75,000. Lands, 4 claims, on Clipper hill, Bingham Canyon, Salt Lake county, Utah. Idle.

NEGOCIACION MINERA LA ROCA NEGRA.**MEXICO.**

Mine sold, circa 1903, to American-Mexico Mining & Development Co.

ROCK LAKE MINING CO., LTD.**ONTARIO.**

Liquidated, 1905, and property sold to Algoma Copper & Smelting Co.

ROCKLAND COPPER CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Silverton, B. C.

ROCKLAND COPPER CO., LTD.

Office: 568, The Bourse, Philadelphia, Pa.

ROCKY MOUNTAIN CONCENTRATING & MILLING CO.**COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Edgar S. Moulton, manager, at last accounts. Ores carry gold, silver and copper. Has gasoline power, 25-stamp mill and 75-ton concentrator.

ROCKY MOUNTAIN COPPER CO.**WYOMING.**

Office: Marcellus, Mich. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Geo. W. Kroll, president; Earle R. Clemens, vice-president and general manager; Arthur E. Bailey, secretary; J. V. Goodwin, superintendent. Organized August, 1902, under laws of Wyoming with capitalization \$100,000, shares 10c. par. Lands, 8 claims, area 160 acres, in the Upper Platte district, showing oxide and carbonate ores in gossan, opened by sundry pits and shafts, deepest 55'.

RODMAN MINING & MILLING CO.**NORTH CAROLINA.**

Letter returned unclaimed from former office, Brooklyn, N. Y. Has a

small mill on its property, in Guilford county, North Carolina. Presumably idle.

BERNARDINO RODRIGUEZ.

MEXICO.

Office and mine: Mazapil, Zacatecas, Mexico.

SEVERIANO RODRIGUEZ.

MEXICO.

Office and mine: San Pedro Ocampo, Zacatecas, Mexico.

ROGERS COPPER & IRON CO.

TENNESSEE.

Office: McComb, Ohio. Letter returned unclaimed from former mine office, Ducktown, Polk Co., Tenn. C. H. Shuler, president; C. S. Hoskinson, vice-president; W. J. Stark, secretary; C. C. Glecker, treasurer; J. A. Ewing, general manager. Organized June, 1902, under laws of South Dakota. Lands, 300 acres, carrying copper and iron ores.

ROGERS MINING CO.

COLORADO.

Letter returned unclaimed from former mine office, Pearl, Larimer Co., Colo. Lands, 6 claims, area 110 acres, said to adjoin the Kurtz-Chatterton, opened by 135' and 1,100' crosscut tunnels, showing low-grade disseminated malachite, azurite and chalcopyrite. Is controlled by the National Mining & Milling Co.

ROGUE RIVER MINING & SMELTING CO.

OREGON.

Mine office: Grants Pass, Josephine Co., Ore. A. Pearson, superintendent. Property is to be a 100-ton furnace, at Savage Rapids, on Rogue River, near Grants Pass. Management announced, at end of 1905, that smelter would not be installed until spring, owing to delay in manufacture.

LA ROMANERA GROUP.

SPAIN.

Offices: care of M. Yglesias, owner, 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: Paimogo, Huelva, Spain. Group includes the San Vicente and other mines, showing several veins, largest circa 40' wide at top, and wider at depth, carrying cupriferous iron pyrites, with gold and silver values.

RONQUILLO COPPER CO.

MEXICO.

Office and mine: 2 Post Office Bldg., La Cananea, Sonora, Mexico. Employs 25 men. A. D. Nanney, president; G. C. Eastman, vice-president and superintendent; P. J. Tehaney, secretary. Organized August 31, 1905, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Mexican corporation is the Ronquillo Mining Co., S. A.

Lands, 82 pertenencias, including the Ronquillo group of 72 pertenencias, 4 miles from Janoverachi, 8 miles south of Cananea and $\frac{1}{2}$ mile from the Sonora river, also 10 pertenencias known as the Swansea mine, adjoining the Cobre Grande mine of the Greene Consolidated, at La Cananea. The Ronquillo group has sufficient timber for mining use for some time to come, and fuel is abundant on the surrounding hills.

The Ronquillo mine shows antigua workings, on a vein up to 40' width, traceable nearly one mile, carrying cuprite, melaconite, malachite and azurite near surface, with an iron-porphry gangue. Development is by tunnel and 3 shafts, of which No. 1 shaft, 71' deep, shows 40' of ore at the bottom, averaging 13% copper. No. 2 shaft, 32' deep has given ores assaying up to 35% copper. Both Nos. 1 and 2 shafts were abandoned on account of soft ground.

No. 3 is the main working shaft, and is being sunk in the country rock, with 2 compartments, and was circa 100' deep at the close of 1905. Crosscuts will be driven at a depth of circa 300'. Water in this shaft is strongly impregnated with copper, and the ores carry fair gold and silver values. Water for mine purposes and potable use is secured from springs, 300' from the main shaft. Nearest railroad is at La Cananea.

The Swansea mine is opened by a tunnel, showing an ore body of circa 75' width, of concentrating grade, and considerable ore has been stocked on the dump. Equipment includes steam plant and air-compressor, and buildings include a store and 2-story stone office building. Company is said to plan building a mill for the Swansea mine.

RONQUILLO MINING CO., S. A.

MEXICO.

Is the Mexican corporation of the Ronquillo Copper Co.

ROOSEVELT GOLD & COPPER MINING CO.

ARIZONA.

Office: care of W. G. McDonald, president and general manager, P. O. Box 477, Bisbee, Ariz. Property, 15 miles from Ft. Thomas, Graham county, on the Gila Valley, Globe & Northern railway, is developed by a 60' shaft showing cuprite, malachite, chalcocite and chalcopyrite, of good assay value. Presumably idle.

RØROS KOBBERVÆRK.

NORWAY.

Mine office: Røros, Trondhjem, Norway. Employs 600 men. Property is a group of old mines, including the Storvarts, Kongens, Kristian VI, Muggruben and Arvedals Grube, partly owned by the government. From A. D. 1646 to 1897, this group of mines produced 73,000 metric tons of fine copper, and to the same date exported 260,000 tons of pyrites, the aggregate value of production to that date being upwards of \$35,000,000. Ore is chalcopyrite at the Kongens and Arvedals groups, and elsewhere is cupriferous iron pyrites. Ore ranges in copper tenor from 4.5% to 5% in the Kongens group, circa 5% in the Muggruben and 6% to 7% in the Storvarts. The property is operated by power from a new hydraulic installation.

Production 1904, was 18,000 metric tons smelting ore, giving average returns of a trifle better than 4% copper, and 11,000 tons iron pyrites, exported for sulphur contents, giving a production, 1904, of 1,641,920 lbs. fine copper. Production for 1905 is estimated at 1,750,000 lbs. fine copper. Recent improvements should lead to a considerable increase in the production of copper, and also of pyrites for export.

ROSA AMARILLA COPPER CO.

MEXICO.

Office: 33 Portland Blk., Chicago, Ills. Mine office: Pueblo Nuevo, Jalisco, Mex. A. L. Dewar, president; Danl. Campbell, vice-president; F. W. Harnwell, secretary; L. E. Fuller, treasurer; John Mann, superintendent; John A. Kruse, engineer. Organized 1904, under laws of Maine, with capitalization \$5,000,000, shares \$1 par. Is organized under laws of Mexico as the Rosa Amarilla Copper Co., Sociedad Anonima. Lands, 5 groups, including the Rosa Amarilla and Ethel copper groups, and the Talpurito silver group, area circa 300 acres, circa 30 miles southwest of Autlán, also the right, for three years, to prospect and locate claims within an

area of 30 kilometres square, or nearly 400 square miles. Company has 3 water rights denounced, and has leased a timber tract of 1,800,000 acres, which can furnish timber at practically the cost of cutting.

Lands show 4 ore bodies, probably lenses, averaging 100' and upwards in width, with outcrops traceable for several miles. An average of upwards of 300 assays gives 7.8% copper, 6 oz. silver and a trace of gold, from oxide, carbonate and sulphide ores. Development is by two shafts, deepest 105', at last accounts, and by 4 tunnels, in addition to which some diamond drilling has been done. Property is 26 miles from the Pacific and company controls a harbor known as Puerto de Natividad. A road between the mine and port can be built with a grade not exceeding 4% at any point, and averaging about 100' per mile. Coke from Japan can be delivered at the dock for about \$8 per ton.

COMPANÍA MINERA ROSARIO.

ARGENTINA.

Property is located in the Calamuchita district, circa 60 miles southwest of Córdoba, Argentina. Ore body is iron pyrites, carrying chalcopyrite, with quartz gangue, averaging 5% to 6% copper. Has a smelter with a 36" blast-furnace, making matte averaging 65% copper and 30 oz. silver per ton, which is sent to Great Britain for reduction and refining, when mine is working. Presumably idle.

MINA EL ROSARIO.

CHILE.

Mine office: Tamaya, Ovalle, Chile. Is owned by the Familia Lecaros. Mine, opened 1850, is about 550' deep. Idle for several years.

ROSEMAN GROUP.

CALIFORNIA.

Office: care H. Roseman, Redding, Shasta Co., Cal. Lands, 9 claims and a smelter site. Property is slightly developed by shafts and tunnels, showing oxide and carbonate ores near surface, with sulphides at slight depth. Idle for several years.

ROSELLE MINING CO.

BRITISH COLUMBIA.

Letter returned unclaimed from former office, Vancouver, B. C. Property was sundry claims on Haskins Mountain, Liard River division of the Cassiar district, British Columbia, said to show large bodies of low-grade zinc and copper ore.

ROSE MINE.

CALIFORNIA.

Letter returned unclaimed from former mine office, Victor, San Bernardino Co., Cal. Mine, in the Morongo district, circa 45 miles southeast of Victor, shows auriferous and argentiferous copper ores, and has shipped a little hand-sorted high-grade ore.

ROSEMONT COPPER CO.

ARIZONA.

Office: care of Lewisohn Estate, 42 Broadway, New York. Mine office: Rosemont, Pima Co., Ariz. Geological conditions are said to be similar to those at Bisbee, and ore bodies apparently are large. Idle for several years, but said to have been bonded, early in 1906.

ROSEWOOD CREEK COPPER & GOLD

AUSTRALIA.

MINING CO., LTD.

Offices: 7A, Upper St. Martin's Lane, London, W. C., Eng. R. K. Evans,

secretary. Organized July 31, 1903, as reconstruction of the Great Northern Copper & Gold Mining Co. of Queensland, with capitalization £150,000, shares 5s. par. Lands, 265 acres, in the Rosewood goldfield, Queensland, Australia.

ROSSLAND-GREAT WESTERN MINES, LTD. BRITISH COLUMBIA.

Reorganized, May 17, 1902, as Rossland Kootenay Mining Co., Ltd. **ROSSLAND-KOOTENAY MINING CO., LTD. BRITISH COLUMBIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Rossland, B. C. C. Williamson Milne, chairman; Wm. Thompson, general manager; Bedford McNeill, consulting engineer; F. A. Labouchere, secretary. Organized May 17, 1902, as reconstruction of the Rossland-Great Western Mines, Ltd. and Kootenay Mining Co., Ltd., with capitalization £150,000, shares £1 par; issued, £148,607. Lands, 171 acres, carrying auriferous and argentiferous copper ores, of low grade. Idle since August, 1904.

ROSS MINING & MILLING CO. COLORADO.

Office: Ross Bldg., Waynesburg, Pa. Mine and works office: Silverton, San Juan Co., Colo. Employs 140 men. Timothy Ross, president; R. E. Clemson, vice-president; Frank L. Ross, secretary; J. B. Ross, general manager; Patrick Lonergan, mine superintendent; W. L. Hoyt, smelter superintendent; A. W. Harrison, engineer. Organized December 13, 1905, under laws of Colorado, with capitalization \$2,500,000, shares \$1 par; issued, \$1,400,000. Financial statement, as of date May 23, 1906, gave assets of \$561,750, including property, inventoried at cost, with liabilities of \$192,500, including payments not yet due, on bond and lease, with \$25,000 cash on hand and ore and supplies on hand, \$30,000. Pittsburg Trust Co., transfer agent and registrar. Annual meeting, second Saturday in September.

Lands, 42 lode claims and 3 placer claims, area 300 acres, also 3 mill-sites, area circa 80 acres, with sundry miscellaneous lands, giving total holdings of 750 acres, in the Animas, Eureka and Red Mountain districts. Mining lands include 3 groups, known as the Champion, Belle Creole and Galtie Boy. Property is held under a working bond and lease, partly paid, from the San Juan Smelting & Refining Co.

The Champion group, which is on a productive basis, shows 3 fissure veins, in granite, opened by a 45' shaft and by tunnels of 150', 375', 800' and 1,700', with a total of 2,550' of workings, showing ore giving average assays of 5.5% copper, 25 oz. silver and \$10 gold per ton. The Champion was opened circa 1885, and is equipped with a 75-h. p. steam plant, 5-drill Rand air-compressor and 7 mine buildings.

The Belle Creole mine shows two fissure veins, in andesite, of 20' width and 1,600' length, slightly developed by shafts of 15' and 35', and by tunnels of 75' and 150', showing low grade milling ore carrying circa 15% lead, 12% zinc, 15 oz. silver and \$4 gold per ton. The property is practically without equipment.

The Galtie Boy shows 3 veins, occurring as fissures in andesite, these averaging 6' width and traceable 3,000', opened to a depth of 600' by a 50' shaft and by tunnels of 350' and 2,500', with total workings of 2,900'. Ore

gives average assays of 3% copper, 10% lead, 10 oz. silver and \$5 gold per ton. Equipment is a 5-h. p. gasoline hoist.

The reduction plant, known as the Kendrick & Gelder smelter, is at Silverton, 1,500' from the Champion, 2,000' from the Galtie Boy and 3 miles from the Belle Creole mine, served by the Denver & Rio Grande and the Silverton, Gladstone & Northern railroads. Plant includes a 125-ton blast-furnace, employing 65 men, in three 8-hour shifts. Product is matte carrying 45% to 50% copper, circa 200 oz. silver and 3 oz. gold per ton, sent to the United States smelter, at Salt Lake, for refining. This plant does a general custom business.

The company plans extensive mining developments, during 1906, including the addition of electrical equipment at all mines, bringing the Belle Creole and Galtie Boy mines to a productive basis, building a 20-stamp mill at the latter and installing new power plants, with air-compressors, at both the Galtie Boy and Belle Creole. At the smelter it is planned to install a new 40x140" blast-furnace.

ROUILLARD COPPER MINES.

NEW HAMPSHIRE.

Mine office: Woodsville, Grafton Co., N. H. Property is on Mt. Gardner. Idle since 1902.

ROUSE-GARDNER MINING CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. J. W. Bostwick, manager. Property is the Gardner mine, carrying gold silver and copper ores. Has steam power.

ROUTT COUNTY GOLD & COPPER MINING CO.

COLORADO.

Office: 635 Seventeenth St., Denver, Colo. W. T. Perkins, president; F. E. Coe, secretary and treasurer. Organized March, 1903, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 5 claims, area 50 acres, in Routt county, Colorado, 100 miles from nearest railroad, developed by about 1,000' of tunnels, said to show a considerable quantity of ore assaying \$3.50 to \$150 per ton, in gold, silver, copper and lead. Idle.

ROWAN GOLD & COPPER MINING CO.

NORTH CAROLINA.

Office: Salisbury, N. C. Alvin Merriam, superintendent. Property is the Oddie gold-copper mine, equipped with steam power, a 10-stamp mill and leaching plant, using the Mead process on concentrates.

ROYALBERG COPPER MINES, LTD.

NORWAY.

Offices: 2, Basinghall Ave., London, E. C., Eng. Mine office: Kongsberg, Norway. E. T. Evans, secretary; Ingwolf Otterbeek, superintendent. Organized April 24, 1903, with capitalization £100,000, shares £1 par; issued, £81,600. Lands, 18 claims, area circa 50 acres, title by crown grant, also 20 acres timber lands, in the Fiskum district, opened by shafts of 40', 70', and 100', and by tunnels of 120' and 250', showing four 3' fissure veins in volcanic, mica-schists, giving average assays of 14% copper, 20% lead, 10% zinc and 24 oz. silver per ton, from sulphide ores, and estimated to show 30,000 tons of ore, with 15,000 tons blocked out for stoping. The West Norway railroad is 2 miles distant, and it is proposed to develop 100 h. p. from a nearby

waterfall. A small concentrator has been erected at the mine, and concentrates are being shipped to British works, for reduction.

ROYAL CONSOLIDATED MINES OF EL COBRE, LTD.

CUBA.

Succeeded, circa 1902, by El Cobre Mines.

ROYAL COPPER CO.

NEW MEXICO.

Property sold, 1901, to Aberdeen Consolidated Gold & Copper Co.

ROYAL COPPER MINING CO.

UTAH.

Title changed, 1902, to Cactus Smelting & Copper Co.

ROYAL CROWN MINING CO.

MEXICO.

Office: Independencia No. 38, Oaxaca, Mex. Mine office: Ocotlán, Oaxaca, Mex. Gustavo Stein, president; Teodoro Meyer, secretary and treasurer; A. Hopley Woolrich, general manager; Martin Aguirre, superintendent. Organized under laws of Mexico, with capitalization \$300,000, shares \$1 par; paid in, \$135,000. Lands, 80 acres, also a 10-acre smelter site, in the Ocotlán district, showing 4 contact veins, between quartzite and andesite, of which two are being developed, these averaging 3 metres width and giving average assays of 13% copper, 739.66 grams silver and \$23 gold per ton, from malachite, azurite and chrysocolla in the oxidized zone, and from chalcopryrite below the water-level. Is opened by shafts of 122' and 125' and is served by the Ocotlán & Ejutla railway, ½ mile distant.

ROYAL GOLD & COPPER CO.

UTAH.

Apparently succeeded, 1904, by Nevada-Utah Mines & Smelters Corporation. It is extremely difficult to keep track of the births, mergers and deaths of Senator Lewis's promotions, and his undue reticence in furnishing obituaries does not aid in the labor of the necrologist.

ROYAL PURPLE GROUP.

NEW MEXICO.

Office and mine: care of Wm. H. Ashton, owner, Tres Piedras, Taos Co., N. M. Lands, 9 claims, 6 patented, developed by a 300' tunnel, showing auriferous copper ore of good grade.

RUBY COPPER & GOLD MINING CO.

WYOMING.

Letters returned unclaimed from former office, Chicago, Ill., and from former mine offices, Woodside, Collins and Encampment, Wyoming. Is said to have done a little work, near Encampment, in 1903.

RUBY GOLD & COPPER CO.

MEXICO.

Office: 33 Broad St., New York. Letter returned unclaimed from former mine offices, San Marcial, Sonora, Mexico. Floyd B. Wilson, president and counsel; Henry J. Davidson, vice-president; Frederick Jones, secretary and treasurer; Chas. R. Davenport, superintendent. Organized November 28, 1900, under laws of Arizona, with capitalization \$2,000,000, shares \$10 par, in \$100,000, cumulative 10% preferred and \$1,900,000 common stock.

Lands, sundry claims, circa 40 miles northeast of Ortiz, Sonora, including the mina Magistral, apparently slightly developed, and Los Angeles mine, having a 300' shaft and several hundred feet of drifts. Has a smelter, said to have been blown in, June, 1905. Property was idle at last accounts, owing to depredations of the Yaqui Indians.

RUBY HILL COPPER MINING & SMELTING CO.

CALIFORNIA.

Presumably dead.

RUBY HILL TUNNEL & MINING CO.

NEVADA.

Mine office: Eureka, Eureka Co., Nev. A. P. Mayberry, superintendent. Lands, sundry claims, between the Richmond and Connor mines, opened by a tunnel, said to be 2,200' long. Work was resumed late in 1905.

RUBY KING COPPER MINING & TOWNSITE CO.

CALIFORNIA.

Letter returned unclaimed from former office, Sacramento, Cal. Lands, 11 claims, in Sections 29 and 32, T. 17 N., R. 6 W., Colusa county, California, showing float copper.

RUBY MINING CO.

WASHINGTON.

Office: Mansfield, Ohio. Mine office: Nighthawk, Okanogan Co., Wash. Employs 10 men. Monroe Harman, president and general manager; Dr. S. P. Ecki, vice-president; C. Bushnell, secretary and treasurer; preceding officers, M. L. Branyan and Jas. A. Hower, directors. Organized November 16, 1902, under laws of Washington, with capitalization \$1,500,000, shares \$1 par; issued, \$350,000. Company reported, early in 1906, that it had \$10,000 cash on hand, and was free from debt. Annual meeting, second Tuesday in June.

Lands, 7 claims, area 153 acres, 53 acres patented, with miscellaneous lands giving total holdings of 206 acres, on the Similkameen river, 3 miles south of the international boundary, 75 miles from a railroad, on Mount Chopaca, with country rock of syenite, carrying fissure veins showing argentiferous and cupriferous pyrrhite, in 3 fissure veins of 5' estimated average width, opened by tunnels of 211' and 951', with 3,100' of workings, estimated to give 10,000 tons of ore blocked out for stoping, carrying an average of 1% copper, 2.38% lead, 48 oz. silver and \$1 gold per ton. All work has been done by hand. Returns from 166 tons of ore shipped were \$11,000 net.

RUDEFEHA MINE.

WYOMING.

Held by Penn-Wyoming Copper Co.

RUDIANSKI MINES.

RUSSIA.

Office: care of T. L. Zamiatnin, Perm, Russia. Property is a group of mines, in the government of Perm. Latest reported production, 1899, was 3,122,112 lbs. fine copper. Output supposedly slightly decreased latterly.

RUDOLPH LAND CO.

WISCONSIN.

Office: care of Rudolph M. Weyerhaeuser, Cloquet, Minn. Mine office: Gordon, Douglas Co., Wis. Organized circa 1905, succeeding the Minong Range Copper Co. Lands are in Sections 11, 12, 13, and 14, Range 43 North, Town 10 West. Property is on the southern fold of the Keweenaw syncline, opened by two 7x10' shafts, deepest 100', sunk at 36° in a dark, amygdaloidal rock, carrying native copper in small quantities. Property is fully described, under title Minong Range Copper Co., in Volume III.

SOCIEDAD ANONIMA COBRES DE RUESGA.

SPAIN.

Office: Bilbao, Spain. Mine offices: San Martin de Los Herreros, Palencia, Spain, and Dehesa de Montojo, León, Spain. Don Julio Lazúr-tigui, president; Don Augustin Cortina, secretary. Organized 1901, with

capitalization 1,500,000 pesetas, shares 500 pesetas par. Property includes the Leonor and adjoining mines, under investigation, at last accounts.

RUMAILLANA TUNNEL CO.

PERÚ.

Mine office: Cerro de Pasco, Junin, Perú. Developement is by the Yauricocha and Mesapata shafts, suspended 1905, and by the Rumailano or Meiggs drainage tunnel, planned to drain and open the entire Cerro de Pasca district. Tunnel was 1,200 meters long, August, 1905 and at that length no ore had been found.

RUSH & BROWN.

ALASKA.

Office and mine: Kasaan, Alaska. Employs 50 men. U. S. Rush and George E. Brown, owners; R. W. Gibson, mine superintendent. Lands, 8 claims, area 160 acres, also a 15-acre millsite, on Kasaan Bay, in the Ketchikan district, showing country rocks of diorite, felsite, quartzite and conglomerate and chloritic schists, with occasional limestone, carrying chalcopryite, associated with magnetite, in veins and in lenticular masses. There are 3 ore bodies, having a generally east and west strike, of which two, developed by shafts of 20', 80', and 80', and by 3 tunnels, longest 160', show an average width of 8', giving ore assaying 3.5% copper, 1 oz. silver and \$2 gold per ton. Management estimates 35,000 tons of ore in sight. Has a small steam hoist and several mine buildings. Mine is served by a tram, taking ore to wharfs at Venus Bay, 3 miles distant, where loaded on vessels and barges, for shipment to smelters.

MARCOS RUSSEK.

MEXICO.

Office and mine: Jiménez, Chihuahua, Mexico.

RUSSELL UNITED COPPER CO.

ARIZONA.

Dead. Lands sold, circa 1904, to Arizona Consolidated Mining Co.

MINA DE RUY GOMES.

PORTUGAL.

Owned and operated by Companhia Mineira Alemtejana.

RUTHBERG CONSOLIDATED COPPER CO.

IDAHO.

Letter returned unclaimed from former office, Banigan Bldg., Providence, R. I. Lands were 112 acres, in the Seven Devils district of Idaho.

RYE COPPER CO.

ARIZONA.

Office: care of Chas. T. Martin, secretary, Globe, Ariz. Mine office: Rye, Gila Co., Ariz. E. F. Eisenhour, president and general manager. Organized 1905, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 17 claims, well timbered and suitable for grazing, east of the Matatzal Mountains, in a slightly explored district, circa 75 miles north of Globe and about the same distance south of Flagstaff. Country rock is diorite, with intrusive porphyry dikes, carrying contact veins showing sulphide ores associated with hematite, near surface. The mine has circa 1,000' of workings, including shafts, tunnels and trenches. Property has an available water power, and the management plans installing a turbine wheel.

SACAJEWEA GOLD & COPPER MINING CO.

MONTANA.

Office: 11 Broadway, New York. Mine office: care of W. J. Anson, secretary, Helena, Mont. Capitalization \$5,000,000, shares \$10 par. Colonel

Henry Altman, president. Lands, 47 claims, in vicinity of Helena, Lewis & Clark county, Montana.

SADDLE MOUNTAIN MINING CO.

ARIZONA.

Office: 1008 F St., Washington, D. C. Mine office: Christmas, Gila Co., Ariz. Employs 200 men. Lewis S. Welch, president; Clarence Stephens, vice-president; Story B. Ladd, secretary; Wilbur W. Delano, treasurer; Geo. B. Chittenden, general manager; A. W. Hendricks, superintendent; Jas. H. Myers, smelter superintendent. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Debentures, \$150,000 authorized, \$140,000 issued, at 6%.

Lands, 1,500 acres, in process of patenting, in the San Carlos district of Gila county and the Saddle Mountain district of Pinal county, Arizona, of which 42 claims were located for copper and 14 claims for gold and silver, with 400 acres of coal lands. The principal group of copper claims is at the junction of Disappointment Valley with the Gila river, on the north side of the river, 15 miles east of Troy, 7 miles from Dudleyville and 8 miles from Winkelman, the present terminus of the Phoenix & Eastern railroad, and the nearest shipping point. Property was opened, 1883, by the San Carlos Copper Co., but was closed, 1884, because found to be located on the San Carlos Indian Reservation, and remained idle until the lands were restored to the public domain, by executive order of the president, December 2, 1902.

Country rocks are porphyry and limestone, latter in various stages of alteration, near the porphyry contact. Ore occurs in contact veins, and also as replacements in limestone, showing carbonate ore with garnetiferous gangue on the limestone wall, and sulphides along the porphyry contact, at depth. Four main ore bodies are being developed, these ranging from 4' to 60' in width, carrying estimated average values of 3% copper, 2 oz. silver and 50 cents gold per ton, from almost every commercial variety of copper ore, including cuprite, malachite, chalcocite, bornite and chalcopyrite, latter occurring disseminated in iron pyrites. Development is by shafts of 175', 175' and 330', with several other shallow shafts of 50' to 150' depth, and by tunnels of 350', 300', 250' and 200', connected by drifts along the contact, and by tunnels of 600', 100' and 150', unconnected, giving a total of about 2 miles of underground workings, exposing a large amount of ore, from which extraction, early in 1906, was 200 tons daily. The ore has been exposed by surface-cuts as well, and it is probable that a considerable amount of ore can be won open-cast. The mine has a 75-h. p. steam plant, including one 5x8' hoist and two 6x8' hoists, good for about 500' depth, with 10 buildings for various uses.

The company's coal lands, in the lower basin of Deer Creek, show a 5' vein of coal, apparently of coking grade, and the company may build coke-ovens and connect the mine and ovens with the smelting plant by an electric line.

The smelter, at the mines, receives ore by wagon and tram therefrom, and has a daily capacity of circa 225 tons. The old smelter, erected in 1884,

by the San Carlos Copper Co., had two small water-jacket blast-furnaces, which were used by present company for experimental purposes only, and have been torn down and replaced by a 150-ton Mitchell economic hot-blast furnace. Product is matte carrying 60% to 65% copper, 12 oz. to 14 oz. silver and 0.35 oz. gold per ton, shipped for refining to the Boston & Colorado smelter, at Denver, and to the Arizona Smelting Company's works, at Humbolt. A little custom smelting is done occasionally, to accomodate neighboring properties. The smelter was blown in, August, 1905, but interruptions of the coke supply, and floods on the Gila river, caused very irregular running, until January, 1906, since which time there has been some trouble with fuel supply, but coke for 2 months running was secured in April, and more regular operations are hoped for.

Production, 1905, was 450,000 lbs. fine copper, and the 1906 output is estimated by the company as likely to be 2,400,000 pounds. Ores smelted in 1905 gave average returns of 3% copper. Cost of mining was \$2 per ton. The company plans bridging the Gila river, and continuing development on a fair scale. Management is good, and the property is of much more than average promise.

SADO MINE.**JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

SAGINAW DEVELOPMENT CO.**ARIZONA.**

Merged, March, 1906, in American-Saginaw Development Co.

SAGINAW MINE.**ARIZONA.**

An old and idle copper mine, in the extreme foothills about 7 miles south of Tucson, Pima county, Arizona.

SAGINAW MINE.**MONTANA.**

Letter returned unclaimed from former mine office, Dillon, Mont.

SAGINAW MINING CO.**WASHINGTON.**

Mine office: Maple Falls, Whatcom Co., Wash. Has copper-gold ores.

SAGINAW VALLEY COPPER MINING CO.**WYOMING.**

Dead. Lands were lost, 1905.

SAHUARIPA EXPLORATION CO.**MEXICO.**

Mine office: Sahuaripa, Sonora, Mex. Lands are a number of properties in the Sahuaripa district, including the Mina Esperitu Santo, 12 miles east of Sahuaripa, opened circa 1842, and closed in 1900, owing to striking of water. This has a blanket vein of argentiferous and plumbiferous tetrahedrite, carrying up to 250 oz. silver per ton. Idle.

SAHUAYACAN MINING CO.**MEXICO.**

Office: Pittsburg, Pa. Mine office: Jesús Maria Ocampo, Chihuahua, Mexico. Leo Reed, manager. Property includes the Veronica and other mines, carrying auriferous and argentiferous copper ores, developed by a 350' main shaft. Has steam power and a 20-stamp mill, employing about 100 men, at last accounts.

ST. CROIX CONSOLIDATED COPPER CO.**WISCONSIN.**

Office: Superior, Wis. Organized 1903, under laws of Wisconsin, with capitalization \$1,500,000, shares \$1 par. Lands, 9 groups, area 22,000 acres,

in Douglas county, Wisconsin, carrying the western extension of the Keweenaw copper belt of Michigan. Idle.

ST. CROIX SECURITIES & DEVELOPMENT CO. WISCONSIN.

Office: 901-52 Broadway, New York. Hezekiah Holbert, president; E. B. Holbert, secretary; W. H. F. Holmes, superintendent.

ST. DAVID'S GOLD & COPPER MINES, LTD. WALES.

Succeeded, July 21, 1903, by St. David's Gold Mines (1903), Ltd.

ST. DAVID'S GOLD MINES (1903), LTD. WALES.

Offices: 29, Cornhill, London, E. C., Eng. Mine office: Barmouth, North Wales. G. C. Isaacs, chairman; E. T. McCarthy, consulting engineer; H. J. Nicholls, mine manager; J. Junner, secretary. Organized July 21, 1903, as a reconstruction of St. David's Gold & Copper Mines, Ltd., with capitalization £60,000, shares 5s. par; fully issued and 4s. 6d. paid in. Debentures, £40,000 authorized, £10,000 outstanding, at 6%. Lands, 800 acres, carrying gold and copper ores. Has a 50-stamp mill and an Elmore oil concentration plant. Paid dividends of 10%, 1904.

ST. EUGENE CONSOLIDATED MINING CO., LTD. BRITISH COLUMBIA.

Mine office: Moyie, East Kootenay, B. C. Is controlled by the Consolidated Mining & Smelting Co. of Canada, Ltd. Lands, 484 acres, with an extensively developed silver-lead mine. Equipment includes a 40-drill air-compressor, hoist, etc., and a 500-ton concentrator, putting about 5 into 1. Ore averages circa 12.5% lead and 7 oz. silver per ton, with an average value of \$52 per ton. Production, for fiscal year 1905, was 40,462,141 lbs. lead and 1,029,820 oz. silver, with gross values of \$1,820,011.53, giving a net profit of \$575,827. Has paid dividends of \$280,000 yearly, for some years.

ST. GEORGE COPPER MINING CO. UTAH.

Office: care of Clarence K. McCornick, president, Salt Lake City, Utah. Mine office: St. George, Washington Co., Utah. Capitalization, \$400,000. Grant C. Snyder, secretary and manager; B. L. Cutler, superintendent. Lands, sundry claims, in the Dugway Mountains. Main shaft, 100', on a 4' to 5' vein, giving assays of 4% to 40% copper. Has gasoline power and a small smelter, and is doing systematic development work and levying assessments. Management is good, and property is well regarded.

ST. JOE MINING CO. UTAH.

Office: 61 Commercial Blk., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. R. A. Hasbrouck, president; Wm. S. Burton, secretary. Capitalization \$1,000,000, shares \$1 par. Lands, 17 claims, area 340 acres, developed by upwards of one mile of underground workings, including a tunnel one half mile long, at end of 1905, planned to be driven one mile, which is the second deepest working tunnel of the Bingham camp. A winze from this tunnel is said to show good ore. Litigation over titles was settled, circa 1905, in the company's favor, in the United States Supreme Court. Property is considered promising.

ST. JULIAN GOLD MINING CO. MONTANA.

Office: care of W. A. Bercry, president, 61 East Warren Ave., Detroit, Mich. Mine office: Chico, Park Co., Mont. J. F. Nolan, manager. Lands

include the Bercry, Bullion and Copper Queen claims, carrying gold, silver and copper. Has steam power and an Elspass mill.

ST. LAWRENCE COPPER CO.

Organized March, 1905, under laws of New Jersey.

ST. LAWRENCE MINE.

MONTANA.

Mine office: Saltese, Missoula Co., Mont. Lands, sundry claims, lying near the Richmond and Monitor mines, 6 miles southwest of Saltese, with ore opened on a vein lying parallel to that of the Richmond and Monitor.

ST. LAWRENCE MINE.

WASHINGTON.

Office: 312 Trader's Blk., Spokane, Wash. Mine office: Twisp, Okanogan Co., Wash. Owned by W. R. Marvin, T. H. Boyd and P. F. McLaughlin. Lands, 4 claims, in the Twisp district, Cascade Mountains, Washington, circa 60 miles from a railroad, showing a strong vein giving assay values of about \$40 per ton, in copper, gold and silver. Idle.

ST. LOUIS COPPER CO.

ARIZONA.

Dead. Formerly had an office at 721 Olive St., St. Louis, Mo.

ST. LOUIS COPPER MINING & DEVELOPMENT CO.

Office: 706 Chestnut St., St. Louis, Mo.

ST. LOUIS MINE.

NEW MEXICO.

Owned by Southwestern Copper & Iron Co. and leased to Burro Mountain Copper Co.

ST. LOUIS MINE.

WASHINGTON.

Owned by Conservative Mining Co.

ST. LOUIS UNITED COPPER MINING CO.

NEW MEXICO.

Letter returned unclaimed from former office, 313 North 9th St., St. Louis, Mo. Mine office: Jarilla, Otero Co., N. M. Property is the Garnet mine, said to be under lease to the Calaveras Mining Co., of Pittsburg, Pa.

ST. LOUIS-VASSAR MINE.

UTAH.

Mine office: Park City, Summit Co., Utah. Robert Gorlinski, manager. Ores carry mainly silver, with fair values in copper, lead and gold. Idle.

ST. MARIE COPPER CO.

COLORADO.

A swindle, perpetrated by John Reilly and W. W. Wilson, two notorious confidence men. Claimed to be incorporated under laws of Wyoming, and to have property near Leadville, Lake county, Colorado.

ST. MARY'S CANAL MINERAL LAND CO.

MICHIGAN.

Entire stock issue is held by St. Mary's Mineral Land Co.

ST. MARY'S COPPER CO.

MICHIGAN.

Wound up, circa 1899, and lands sold to Arcadian Copper Co.

SAINT MARY'S MINERAL LAND CO.

MICHIGAN.

Office: 701-199 Washington St., Boston, Mass. Local office: Houghton, Houghton Co., Mich. Employs circa 60 men. Nathaniel Thayer, president; Chas. J. Paine and J. Henry Brooks, vice-presidents; Arthur G. Stanwood, secretary and treasurer; preceding officers, Samuel N. Brown, Albert S. Bigelow, Chas. E. Perkins, Geo. P. Gardner, Walter Hunnewell, Chas. N. King and Nathaniel H. Stone, directors; R. R. Goodell, local manager; Dr. L. L. Hubbard, consulting engineer; Rex R. Seeber, mine superintendent;

Wm. Skewes, mining captain. Organized March 4, 1901, under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par; issued, \$3,750,000. Company holds the entire stock issue, except founders shares, of St. Mary's Canal Mineral Land Co., organized 1863, under laws of New York, to take over lands given by the state for construction of the first ship canal at Sault Ste. Marie, lands so given being 180,000 acres in Houghton, Ontonagon and Keweenaw counties, and from which tracts the Calumet & Hecla, Tamarack, Baltic, Trimountain, Champion and other mines have been developed. Shares are listed on the Boston Stock Exchange. Old Colony Trust Co., Boston, registrar.

Lands, 95,839 acres in fee, and mineral rights to 14,216 additional acres, lands being scattered along the Lake Superior copper belt, with principal holdings on the South Range, southwest of Houghton. No lands were sold during 1905. Other assets are 50,000 shares of stock of the Champion Copper Co., being a one-half interest in that corporation; 55,000 shares King Philip Copper Co., being a control; 20,000 shares Pacific Copper Co., being a half interest, 208 shares Copper Range Consolidated Co., 842 shares Winona Copper Co., 80 shares Old Colony Copper Co., 25,000 shares Mayflower Mining Co. The company also owns the Challenge mine, outright. From 1863 to 1900 the old company paid cash dividends of \$2,200,000, also stock dividends of one share Tamarack, one share Iroquois, $1\frac{1}{2}$ shares Baltic, $\frac{1}{2}$ share Winona and $\frac{1}{2}$ share Albany & Boston, on each share of St. Mary's stock. The company is in receipt of a large income from the dividends of the Champion Copper Co. Dividends were \$1 per share in 1903, \$1 in 1904 and \$2 per share in 1905. The company issued 10,000 shares, at \$50, to shareholders, February, 1906, raising \$500,000 for development of the Challenge and King Philip mines. During 1905 the company sold land, timber and wood to the value of \$225,792, and ended the year with \$177,295 cash on hand.

The Challenge mine, in Section 22, Town 53 North, Range 35 West, is circa 5 miles south of the Champion mine. Extensive diamond drill borings having located the southern extension of the Baltic amygdaloid bed, sinking was begun Sept. 10, 1904, and a vertical drop shaft was bottomed, in the ledge at a depth of 114', in January, 1905. The vertical shaft, which will be replaced ultimately by an incline shaft, upraised from the permanent workings, at the permanent angle of the lode, was deepened to 300', and the lode reached by crosscuts, the third level having been opened March, 1906. On the first level the drifts show a 13' amygdaloid, of healthy appearance, showing large amygdules carrying considerable calcite, which evidently is the Baltic bed or its twin amygdaloid, fairly mineralized, but not up to the average Baltic values. Equipment at the Challenge includes a Parker horizontal water-tube boiler, maintaining a steam pressure of 150 lbs. per square inch, with wood as fuel. A new air-compressor and a Nordberg hoist, good for 1,500' depth, were installed in March, 1906. The showing at the mine is decidedly promising.

Owing to the great extent of its lands, mainly located on the Keweenaw copper belt, and stretching along the mineral range for scores of miles, the

landed holdings of the company are of vast potential value. For the past seven years the company has refused to sell any mineral lands outright, but will join its lands with those of other holders in forming new companies, taking pay in shares, on a pro rata basis, and securing a control where possible. This policy involves heavy outlays for exploratory and development work, but it has resulted, already, in making one magnificent new mine, the Champion, which can furnish funds for both dividends and development work elsewhere, and a continuance of this policy must result eventually in making St. Mary's Mineral Land Co. the part or sole owner of a number of excellent mines. The management is vigorous and far-seeing, and in the course of time, unless the present policy be changed, the company will become a very important factor in the production of Lake Superior copper.

ST. MICHAELS MINING, MILLING & REFINING CO. NEW MEXICO.

Mine office: Tres Piedras, Taos Co., N. M. Presumably idle.

ST. PAUL MINE. COLORADO.

Mine office: Red Mountain, Ouray Co., Colo. G. T. Braden: owner; J. I. Sweet, superintendent, at last accounts. Ores carry silver, lead and copper. Has steam power.

ST. REGIS COPPER MINING & MILLING CO. MONTANA.

Office: care of A. M. Stevens, secretary, Missoula, Mont. Mine office: St. Regis, Missoula Co., Mont. Was bonded, March 1, 1906, for \$35,000, to residents of Wallace, Idaho.

SALIDA GOLD & COPPER MINING CO. COLORADO.

Presumably dead, as property was a 10-year lease on holdings of the Sedalia Copper Co., now held under option direct from the Sedalia Copper Co. by the Shawmut Consolidated Copper Co.

SALIDO GOLD-COPPER CO. MEXICO.

Office: 823 Hellman Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Alamos, Sonora, Mexico, Dr. Finis E. Yoakum, president and general manager; N. N. Dietz, secretary. Organized under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 30 pertenencias, in the Alamos district, said to show a 60' vein. Stock of the company is "insured" and "guaranteed," hence the company is looked upon as a mere stock-jobbing scheme.

SALISBURY COPPER CO. NORTH CAROLINA.

Office: P. O. Box 33, Salisbury, N. C. Employs 14 men. T. B. Brown, president; W. S. Blackmar, secretary; Richard Eames, treasurer and general manager. Organized 1904, under laws of Arizona, with capitalization \$100,000, shares \$100 par. Lands, 50 acres, owned in fee, on the line of the Southern Railroad, in Rowan county, North Carolina, showing country rock of slate, carrying several fissure veins, of which one, of 15' average width, developed by a shaft of 100', gives average assays of 15% copper, 2 oz. silver and \$5 gold per ton. Company plans continuing development.

SALMON RIVER MINING CO. NEVADA.

Mine office: Contact, Elko Co., Nev. Moses Jones, superintendent

at last accounts. Ores carry gold, silver and copper. Has gasoline power and a small smelter. Presumably idle.

COMPANÍA MINERA DE SALTILLO.**MEXICO.**

Office: 9A de Hidalgo, Saltillo, Coah., Mex. Mine office: Concepción del Oro, Zacatecas, Mex. Antonio Rodriguez, president; Angel Rios, manager. Operates the Jesús Nazareno mine, producing gold, silver, lead and copper. Has steam power and employed circa 200 men, at last accounts.

SALT LAKE COPPER CO.

Letter returned unclaimed from former office, Salt Lake City, Utah.

SALT LAKE COPPER MINING & SMELTING CO.**UTAH.**

Organized December, 1905 under laws of Maine.

SAMPO MINING & DEVELOPMENT CO.**FINLAND.**

Office: care of J. H. Jasberg, secretary, Hancock, Mich. Mine office: Joensuu, Kupio, Finland. Employs 50 men. Dr. C. J. Sorsen, president; Jacob Saari, vice-president; Dr Jacob Jackola, treasurer; preceding officers, A. L. Sorsen, Dr. Carl Sederholm, M. Hendel, Carl Brofelt, and Chas. Jackola, directors; Jacob Wilson, superintendent, John Waari, mining captain. Capitalization \$1,000,000, shares \$200 par. Is a close corporation, controlled by Finnish-American residents of the Lake Superior district.

Lands, 2 groups, known as the Hokka and Ori vi mines. The Hokka tract, 240 acres, includes four 40-acre claims, owned outright, and two 40-acre claims, leased for 25 years, under option of purchase. This property is in southeastern Finland, 2 miles from Joensuu, in the Maansekä Mountain range, near the boundary between Finland and Russia, lying circa 200 miles of Viborg. The mine was opened in 1850, and has secured a small production of chalcopyrite, under the most primitive conditions, ore being shipped, on horseback, to the Pitkaranta smelter, for reduction.

The Orijarvi mine, bought from the Fiskars company, is a tract of circa 10 square miles, in a parallelogram of approximately 2x5 miles. This property is said to have produced \$5,000,000 in copper and silver, but has been idle since 1882. Development is by 9 shafts, deepest 600', and diamond drilling, done 1902, shows the ore body to continue to great depth and length. Ore is argentiferous chalcopyrite and sphalerite, latter carrying up to 46% zinc. The old dumps at the mine contain large quantities of zinc, which should become valuable, as a zinc smelter could be built for their treatment, if shipping were found impracticable. Management is good and property is considered promising.

SAMPSON GROUP.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Beasley Camp, via Nelson, Kootenay district, B. C. Lands, 7 miles west of Nelson, show promising sulphide outcrops.

SAMSON MINE.**UTAH.**

Sold, March, 1903, to Bingham Copper & Gold Mining Co.

COMPANÍA MINERA DE SAN ACASIO y ANEXAS.**MEXICO.**

Mine office: San José de Guadalupe, Durango, Mexico. Is a producer of iron ore, copper and gold, employing circa 100 men, at last accounts.

COMPANIA MINERA DE SAN ANTONIO.**MEXICO.**

Letter returned unclaimed from former mine office, La Cruz, Tamaulipas, Mex. Alex. Dozal, manager, at last accounts. Ores carry copper, lead and silver.

SAN BALTAZAR COPPER CO.**MEXICO.**

Office: 508 Germania Bank Bldg., Pittsburg, Pa. Mine office: Tlacolula, Oaxaca, Mex. J. Albert McKay, president; Hon. Pembroke R. Flitcraft, vice-president; Oscar A. Rogers, secretary; Andrew B. Berger, treasurer; Guillermo W. Thompson, general manager; Frank M. Lehmer, superintendent. Organized December, 1904, under laws of Maine, with capitalization \$1,000,000, shares \$10 par; issued, \$780,000. Lands, sundry groups, area 700 acres, also a 40-acre millsite, in the Guelavilla and Tlacolula districts, 8 miles south of the ruins of Mitla. Country rocks are porphyry and limestone, carrying numerous contact veins or lenses, of which 6 are being developed, these having an average width of 8', outcropping for 2 miles. At last accounts had a 50' shaft, showing selected oxide and carbonate ores of 44% copper tenor, while assays of outcrops give 1% to 15% copper, 15 oz. to 20 oz. silver and from nothing to 16% lead. It is planned to develop mainly by tunnels. Property is considered promising.

SAN BARTOLO COPPER MINES, LTD.**CHILE.**

Voluntarily liquidated, 1903.

SAN BERNARDINO COPPER CO.

Organized March 8, 1899, under laws of West Virginia, with capitalization \$2,500,000, \$500 paid in, by J. B. Neily, et al, of Boston

SAN BERNARDINO MINING CO.**MEXICO.**

Office and mine: Schalk Bldg., La Cananea, Sonora, Mexico. Employs 15 men. A. S. Judd, president; J. L. Stroyick, vice-president and superintendent; J. M. Gibbs, general manager; B. N. Norton, consulting engineer. Organized under laws of United States and Mexico, with capitalization \$500,000, shares \$5 par. Lands, 144 pertenencias, 18 miles southeast of Cananea, 2 miles west of a railroad, in the Manzanal Mountains, developed by a 100' shaft, showing a vein of 6' average width, carrying auriferous copper ores that have given assays up to 30% copper, 70 oz. silver and \$8 gold per ton. Small shipments, to the El Paso smelter, netted \$93 per ton. Was worked, circa 1876, for silver, but suspended, owing to raids of Apaches. Property is considered promising.

SAN BERNARDINO MINING & MILLING CO.**ARIZONA.**

Office: care of Robert H. Skiles, secretary, Santa Ana, Cal. Mine office: care of Ray R. Radford, president and general manager, Douglas, Cochise Co., Ariz. Chas. Dolf, vice-president; C. W. McCoy, engineer; preceding officers, Chas. Crawford and L. A. Skiles, directors. Organized, June 24, 1904, under laws of Arizona, with capitalization \$500,000, shares \$10 par; issued, \$250,000. Annual meeting, second Monday in June. Lands, 16 claims, area circa 300 acres, in the Ash Springs district, 9 miles from the El Paso & Southwestern railway, showing a contact vein between altered limestone and porphyry, opened by shafts of 64', 53', 58' and 46', and by

tunnels of 50' and 120', carrying ores that have given assays of 9% copper, with fair gold and silver values. Was developing by diamond drill, at last accounts.

SAN BERNARDO MINING CO.**MEXICO.**

Letter returned unclaimed from former office, Chicago, Ills. Mine office: Aduana, Sonora, Mexico. Mine is known as the Santo Domingo, and a shaft is being sunk between two veins, known as the Balvanera and Santo Domingo, which are expected to unite at depth. Ores give assays of 46 oz. silver, with small copper and lead values.

SAN CALLETANO MINING & SMELTING CO.**ARIZONA.**

Office: care of C. O'Brien Reddin, general manager, 121 Geary St., San Francisco, Cal. Mine office: Calabasas, Pima Co., Ariz. Lands, 12 claims, in 2 groups, in Santa Cruz and Pima counties, from which selected samples have given assays up to 9% copper, 400 oz. silver and \$2.50 gold per ton.

SAN CARLOS COPPER CO.**ARIZONA.**

Lands are under bond to Saddle Mountain Mining Co.

SAN CARLOS COPPER CO.**MEXICO.**

Office: 25 Broad St., New York. Mine office: Linares, Nuevo León, Mex. Employed circa 800 men, at last accounts. W. H. Nichols, Jr., president; S. H. Steele, secretary and treasurer; Edw. D. Self, general manager. Organized 1896, under laws of New York, with capitalization \$100,000, shares \$1 par. Mining lands, 6 square miles, are in the San Carlos district of Tamaulipas, Mexico, with a smelter at San José, Tamaulipas. Company also owns 6,400 acres of timber lands. Veins are contacts between limestone and porphyry, and ores are oxides, carbonates, and sulphides, mainly the latter. Development is by upwards of 50 shafts and about 7 miles of tunnels, with total underground openings of about 10 miles. Nearest railroad is the Gulf branch of the Mexican Central, 38 miles distant, but it is planned to build a branch railway to the mines. Production, 1903, was officially reported by the Mexican government as 88,184 lbs. fine copper, which is very much under the usual estimates.

SAN CRISTOBAL COPPER CO.**NEW MEXICO.**

Office: 616-116 Broad St., New York. Mine office: Arroyo Seco, Taos Co., N. M. Richard Hopkins, president; B. F. Shakespeare, secretary; J. K. Turner, manager. Organized circa 1901, as successor of Rio Hondo Copper Mining Co. Lands, 1,850 acres, also sundry water-rights and a railroad franchise. Has an 80' ore body, carrying copper, gold, silver and lead, opened by a 1,000' tunnel. Has a smelter and cyanide plant. Original development was for copper, but recent operations have been confined, almost exclusively, to developing a big ledge of gold-bearing quartz.

SAN DOMINGO GOLD & COPPER CO.**ARIZONA.**

Merged, circa 1903, in Picacho Blanco Mining Co.

MINAS SAN DOMINGOS.**PORTUGAL.**

Owned by Mason & Barry, Ltd

SAN FELIPE MINING CO.**MEXICO.**

Office: Philadelphia, Pa. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, said to be in the state of Jalisco, Mexico. Has paid dividends from stock sales, hence, is viewed with deep suspicion.

SAN FERNANDO COPPER MINING & SMELTING CO.**MEXICO.**

Offices: 3637 Fourth St., San Diego, Cal., and care of Woods Investment Co., Colorado Springs, Colo. Mine office: Ensenada, Baja California, Mexico. F. M. Woods, president; H. E. Woods, vice-president; Warren Woods, treasurer; John V. Smale, general manager.

Lands, 180 pertenencias, area 445 acres, in the San Fernando district, circa 240 miles below the California line, 25 miles east of San Carlos Landing, on the Pacific, and 80 miles southeast of the harbor of San Quentin, with a good wagon road from mine to the landing. Mine was discovered by the San Franciscan friars, early in the Nineteenth Century, and is said to have produced upwards of \$500,000, from ore shipped, via San Francisco, to Liverpool, ore ranging as high as 50% in copper tenor, with good gold and silver values. Property shows numerous veins of 3' to 5' width, carrying carbonate ores and chalcocite at surface, changing at depth to chalcopyrite. Shipments by present owners average 20% copper. Equipment includes a hoist, pumps and laboratory. A small force is being worked, on development, and the company is said to plan erecting a smelter.

MINA SAN FRANCISCO.**MEXICO.**

Office and mine: care of D. Alberto Palos, owner, Tapalpa, Jalisco, Mexico. Property, 10 miles south of Virginia Camp, shows a vein carrying copper in small percentages, and gold at the rate of about \$20 per ton, presumably from ores taken from a gossan capping.

MINA SAN FRANCISCO.**MEXICO.**

Mine office: care of G. V. Monteverde y Ca., owners, Pesqueira, Sonora, Mex. Ores carry gold, silver, lead and copper. Presumably idle

MINA SAN FRANCISCO.**PERÚ.**

Owned by Compañía Minera Santa Ines y Morococha.

NEGOCIACION MINERA SAN FRANCISCO y ANEXAS.**MEXICO.**

Mine office: Mineral de Asientos, Aguascalientes, Mexico.

COMPAÑIA MINERA DE FRANCISCO DEL AZUL.**MEXICO.**

Mine office: Matehuala, San Luis Potosí, Mexico.

SAN FRANCISCO DEL ORO MINES, LTD.**MEXICO.**

Offices: 65, London Wall, London, E. C., Eng. Mine office: Parral, Chihuahua, Mex. Earl of Denbigh, chairman; Rowland C. Fielding, consulting engineer; James Hyslop, mine manager; H. A. Searle, secretary. Organized April 18, 1903, with capitalization £375,000, shares £1 par; issued, £280,217. Lands, 253 acres, carrying gold, silver, copper, lead and zinc ores, undergoing development. Shipments are made to nearby smelters, and profits earned in first 18 months are given by company as in excess of £22,000. Company proposes building a reduction plant at the mines.

SAN FRANCISCO MINING CO.**MEXICO.**

Mine office: Autlán, Jalisco, Mexico. L. E. Fuller, president. Organized 1905, to operate in the Autlán district.

SAN FRANCISCO MINING CO.**MEXICO.**

Office: care of J. G. Pritchard, vice-president and general manager, Bisbee, Ariz. Mine office: Arizpe, Sonora, Mexico. H. M. Whitney, president; Fred C. Hagen, secretary; W. E. Tester, assistant secretary; J. W. Wood, treasurer; Peter Pitz, superintendent. Organized October 23, 1905, under laws of Arizona, with capitalization \$60,000 shares \$10 par. Lands, 16 pertenencias, also exploratory rights over 4 square miles of adjacent lands. Property shows several veins of 30' to 9' width, giving good assay values, mainly in gold and silver, with from a trace to 7.19% copper, and up to 50% lead.

FINCA SAN JOAQUIN.**CUBA.**

An old and idle mine, about 30 miles northeast of Cienfuegos, Cuba, worked intermittently, 1856-1885. Ores were shipped to Swansea and the United States for smelting, and are said to have returned an average of nearly 20% copper. Vein ranges up to 30' in width, carrying cuprite, melaconite, azurite, bornite and chalcopyrite.

MINA SAN JOSÉ.**CHILE.**

Mine office: care of Silva y Rivas, owners, Tamaya, Ovalle, Chile. Mine, opened 1844, was 517' deep, at last last accounts.

SAN JOSÉ CONSOLIDATED MINING CO.**MEXICO.**

Mine office: Nocoziari, Moctezuma, Sonora, Mex. Organized under laws of Arizona and protocolized in Mexico. Lands, circa 100 acres, lying near the Moctezuma Copper Co., showing a vein of 5' to 12' width, carrying values mainly in silver and lead, with small gold and copper values.

SAN JOSÉ MINING CO.**CUBA.**

Succeeded, circa 1902, by El Cobre Mines.

MINAS SAN JOSÉ, SAN MIGUEL y EL BRUJO.**SAN SALVADOR.**

Office and mines: care of Luna Hermanos, owners and managers, Metapán, San Salvador, Central America. Ores carry copper, gold and silver. Have steam power and a smelter, employing circa 250 men, at last accounts.

COMPAÑIA MINERA SAN JUAN.**MEXICO.**

Mine office: Puerto de Muleje, Baja California, Mexico.

MINA SAN JUAN.**CHILE.**

Mine office: Copiapó, Atacama, Chile. D. Tomás Marambio, owner. Deepest shaft, circa 1,800'. Was worked originally for silver, but copper values predominate at depth.

MINA SAN JUAN.**SPAIN.**

Mine office: Paimogo, Huelva, Spain. Don José De Soto, manager. Lands, 102 hectares, including 4 old mines. Presumably idle.

MINA SAN JUAN DE MALAJA.**CUBA.**

A promising prospect, with a 100' goossan capping, about 6 miles north-east of Santa Clara, Cuba

SOCIEDAD MINERA SAN JUAN.**CHILE.**

Office: Calle Prat, 55, Valparaiso, Chile. Mine office: Higuera, Coquimbo, Chile. Employs 170 men. Guillermo Lyon, president; José María Muñoz, R., managing director; preceding officers E. A. Sandiford, Ruperto Alvares and Cirilo Armstrong, directors; Miguel Scantlebury, general manager; Ricardo Spargoe, mine superintendent; Ricardo Everett, smelter superintendent. Organized under laws of Chile, with capitalization \$1,000,000, Chilean, par \$20, paid in \$10, in \$300,000 preferred and \$700,000 common stock. Semi-annual meetings are held March and September.

Lands, 29 claims, area 66 hectares, also a 9-hectarea millsite, in the Higuera district. Country rocks are granite and diorite, showing 8 strong parallel veins, opened by a large number of tunnels and by the following shafts: Casas, 70'; Ajo, 500'; Aguilas, 240'; Rosario, 300'; Cocinera, 240'; Capriciosa, 700'; San Juan, 1,200'; Ierma, 200'; San Pablo, 600'. Mines are estimated to have 20,000 tons of ore blocked out for stoping.

Mines were opened 1820, and have been in continuous operation since. The power plant includes 6 hoists, aggregating 180 h. p., good for 1,000' depth, 7 driving engines, and a Siemens & Halske electric plant for lighting purposes and for driving 4 electric rock drills, of the same make. Buildings include a 100x100' machine-shop, a 30x30' carpenter shop and a 30x30' smithy, all of wood, and about 50 dwellings for employees.

Company has two smelters, one at Las Casas mine, and the other, which is the more important, in a valley below and about one mile distant from the mines, from which ore is received in carts. The two smelters have a combined capacity of 230 tons daily. Equipment includes 12 kiln calciners, a 120-ton rectangular blast-furnace and seven 16-ton reverberatory furnaces. Product is a matte of 50% average copper tenor, sent to the works of the Sociedad Chilena de Fundiciones, at Guayacán, for refining. Nearest shipping point is the port of Potoralillo, distant 9 miles from the smelter. Fuel is soft coal, costing \$30, Chilean, per ton, and coke, costing \$35 per ton, Chilean. Average cost of mining is \$3 Chilean, per long ton, and of smelting, \$10, Chilean, per ton. Ores treated average 8% copper. Production, first 5 months of 1906, was circa 1,000 tons fine copper, and for 1905 is estimated at 4,750,000 lbs. fine copper.

SAN JUAN MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. J. I. Perkins, manager, at last accounts. Ores carry gold, silver and copper. Has steam power.

SAN JUAN SMELTING & REFINING CO.**COLORADO.**

Property bonded, December 13, 1905, to Ross Mining & Milling Co.

MINAS SAN LORENZO y ALLENDE.**MEXICO.**

In the Ures district of Sonora, Mexico. Frederick A. Platt, owner. Lands, 36 pertenencias, area circa 90 acres. The San Lorenzo has a 4' vein, assaying as high as 18% copper and 30 oz. silver per ton. The Allende is not so rich, but is said to be a promising property. Presumably idle.

COMPAÑIA BENEFICIADORA SAN LUIS.**MEXICO.**

Works office: San Luis de la Paz, Guanajuato, Mexico. The smelter

is known as the Ojo de Agua. Production, 1903, was 29,054 lbs. fine copper.
COMPANIA MINERA SAN LUIS. MEXICO.

Property, at Tepezalá, Aguascalientes, Mexico, sold to Aguascalientes Metal Co.

SAN LUIS MINING CO.

MEXICO.

Office: 27 William St., New York. Mine office: Gabriel, Durango, Mexico. Employs 1,000 men. Walter S. Logan, president; W. J. Robinson, vice-president; Myra B. Martin, secretary and treasurer; preceding officers, Seymour W. Tulloch, Angel L. Negrete, J. Edward Layne, Walter S. Perry and Col. Britton Davis, directors; Louis Ross, general manager; W. Tomás Moore, assistant manager; Lloyd Roby, superintendent; Andrew Macfarlane, mine superintendent; H. G. Elwes, mill superintendent; Sydney D. Tyler, engineer. Organized November 16, 1900, under laws of West Virginia, and capitalization increased, 1905, to \$3,000,000, shares \$1 par. Statement, as of date January 1, 1906, by company, gives liabilities of \$44,068.70 and cash on hand \$35,450, with \$44,600 due the company. Annual meeting, second Wednesday in April. First dividend, 1%, was paid January, 1906, and a second dividend in July, 1906.

Lands, 64 groups of claims, area 1,241 acres, also a 25-acre millsite, 35,000 acres of timber and grazing lands and 8,000 acres miscellaneous lands, in the San Lucas and Panuco de Coronado districts of Durango. Miscellaneous holdings include El Cura ranch, of 35,000 acres, which furnishes mine timber, cereals and vegetables for workmen, and is being stocked with cattle. During 1905, mineral lands of 160 acres area were bought, giving total holdings of 506 claims, at end of the year.

Country rocks are limestone and porphyry, carrying fissure and contact veins. The different properties of the company show 64 veins of various sizes, degrees of mineralization and promise, of which 6 are being developed, these being estimated by company to carry an average of 3% copper, 12% lead, 1% zinc, 35 oz. silver and \$4 gold per ton, mainly from sulphide ores, the various mines having 3 miles of underground workings, estimated to show 300,000 tons of ore, with 200,000 tons blocked out for stoping. The estimate of average values is more conservative than previously given by the company, and presumably is more nearly correct. Mines were discovered circa A. D. 1650, and were worked, more or less irregularly, until 1830, when closed on account of water and Indian troubles, until reopened, 1901, by the present company.

The San Luis mine shows a large body of copper ore, mainly low in grade, but with some high grade silver ore. During 1905, 2,153' of development work was done in this mine, and for all properties, development during 1905 was 6,675', giving a total of 17,314' of workings, at the end of the year.

The Potosina mine had 1,994' of development work in 1905. The western end of this mine shows a considerable body of ore of smelting grade, and a large quantity of milling ore, the sixth level making an exceptionally good showing. A new hoist is to be added and 2 more levels opened.

The San Gonzalo mine was 350' deep in August, 1905, showing ore of

milling and leaching grade, carrying values mainly in silver above, and in copper on the lower levels.

The Castellana mine, adjoining the San Gonzalo, on the east, carries a continuation of the vein of the latter, which has been proven for a distance of 1,600', by trenches and pits of 10' to 60' depth. Development is by an idle shaft of 120', which it is planned to reopen and deepen.

The Sidney mine has a shallow shaft, showing a 2' vein of galena, assaying up to 45% lead, 40 oz. silver, and 3 grams gold per ton. This property is idle, on account of a heavy inflow of water.

The San Lucas mine, area 19 pertenencias, 35 miles northwest of Gabriel, is an old property, having nearly 2 miles of workings, carrying values principally in lead and zinc. The Aventura mine adjoins the San Lucas, and balance of interest in this property was bought, 1905. An old shaft shows a 3' vein, under a heavy gossan, carrying carbonate ores, giving assays of 32% copper and 12 grams gold per ton.

The San Pablo mine shows parallel veins, presumably joining at depth, which have paystreaks of 6" to 3' width, carrying sulphide ore, giving assays up to 16% copper, 360 oz. silver and 14 grams gold per ton. The old incline shaft has been abandoned, and a vertical shaft, sunk 175', is planned to continue to 300' depth. Operations began June, 1905, on this property, and equipment includes a gallows-frame, hoist, boiler and pump.

Equipment includes steam plants, aggregating 750 h. p. at the mine and 150 h. p. at the mill. The mines have 6 hoists, good for an average depth of 1,000', and 2 Ingersoll-Sergeant air-compressors, of 12 drills capacity. Buildings include a 25x150' stone machine-shop, 25x150' wood carpenter shop, a stone smithy, offices, 4 general stores, and a large number of dwellings, with a total of 180 buildings.

The mill, built of adobe and iron, is 60x180', equipped with 2 Blake crushers, 1 jig and 4 Bartlett tables. Concentration seems to have proven more satisfactory than leaching.

The 120-ton lixiviation plant, known as the Trinidad leaching mill, was treating only 40 tons daily, at last accounts. The sulphide ore is roasted in 2 furnaces, before leaching.

The company maintains 4 general stores and a school for the children of workmen. Nearest railroad is the Mexican International, 12 miles distant. Fuel is wood, costing \$3 per cord, and bituminous coal, costing \$8 per ton. All high-grade ore is shipped to the Monterey and Aguascalientes plants of the American Smelting & Refining Co.

Production, 1905, was 30,725 tons of ore, of which 5,845 tons were shipped as smelting ore, 6,481 tons were leached and 15,118 tons were concentrated. Net earnings for 1905 were \$277,530.87, Mexican currency, and production for 1905 was circa 450,000 lbs. fine copper. The company plans increasing its milling facilities to 200 tons daily and also is considering the building of a narrow-gauge railroad and a producer-gas plant. A railroad or tram system to bring the ores to a central milling plant is badly needed.

The mines of this company are considered valuable, and the local man-

agement seems both competent and vigorous. While the management of Mr. Ross is to be commended, some of the other officers of the company are not so well regarded. The debts of the company are said to have been paid off in 1905, notwithstanding which the capitalization of the company was increased, and the payment of dividends was begun simultaneously with the selling of treasury stock. Any company that resorts to these tactics necessarily rests under suspicion. Messrs. Logan and Treadwell and Miss Martin are regarded with suspicion, because of their connection with the George A. Treadwell Mining Co. The advertisements by Miss Myra Martin, for the San Luis Mining Co., are misleading, as is always the case with the advertisements put out by that talented but ambiguous young lady. Her claim that the copper of the San Luis will cost nothing, is untrue, of course.

SAN MARCEL MINE.**ITALY.**

An old mine, of limited production, in Piedmont, Italy.

MINA SAN MARCIAL.**MEXICO.**

Office and mine: care of Gus Peterson, owner and manager, Rosario, Sinaloa, Mexico. Has auriferous and argentiferous lead and copper ores.

MINAS SAN MARTIN y ANEXAS.**MEXICO.**

Mine office: Ocotlán, Oaxaca, Mex. Frank N. Leonard, president. Lands, sundry claims, 10 miles from Ocotlán, showing an antigua, said to have been worked by Aztecs, before the era of Spanish domination. Mine is said to have produced about \$1,000,000 in values, since 1900, but a company organized on the property came to grief, and was wound up. Equipment includes a new concentrator.

SAN MIGUEL COPPER CO.**NEW MEXICO.**

Mine office: Tecolote, San Miguel Co., N. M. Frank J. Buck, superintendent.

SAN MIGUEL COPPER MINES, LTD.**SPAIN.**

Office: 3, Church Court, Old Jewry, London, E. C., Eng. Mine office: Almonáster La Real, Huelva, Spain. C. de Freitas, chairman; G. Emdin, secretary; Adolph C. Eberbach, managing director; F. O. Harvey, consulting engineer. Organized October 12, 1904, with capitalization £150,000, shares £1 par; issued, £140,000. An issue of £75,000 debentures, at 6%, was fully redeemed from the share premium on a new issue of stock emitted at £2 10s., during 1905. Dividends are paid quarterly, at the rate of 25% per annum.

Lands, 1,900 acres, including the San Miguel mine and sundry adjoining properties, carrying cupriferous iron pyrites. There are circa 350,000 tons of partly leached ore, in teleras and tereros, on surface, and the mine shows about 500,000 long tons of ore, averaging 2.5% copper, blocked out for stopping. The property was worked for some years by a Portuguese company, until taken over, 1904, by present owners. The property has a private railroad, of 19 kilometers, from the mine at Almonáster la Real to El Cerro, on the Ferrocarril Zafra y Huelva, built at a cost of £40,000.

Production, 1904, was 588 tons precipitate and 18,487 tons cupriferous iron pyrites, copper contents of same being 1,612,800 lbs. fine copper. Company seems well managed.

SOCIEDAD MINEIRA DE SAN MIGUEL DE HUELVA. SPAIN.

Succeeded, October, 1904, by San Miguel Copper Mines, Ltd.

COMPAÑIA MINERA DE SAN MIGUELITO. MEXICO.

Mine office: Cumpas, Moctezuma, Sonora, Mexico.

MINA SAN PEDRO. ARGENTINA.

Owned by Famatina Development Corporation, Ltd.

MINA SAN PEDRO. MEXICO.

Mine office: Cedral, San Luis Potosí, Mexico. J. A. Arbide and Roberto Yrizar, owners.

SOCIÉTÉ ANONYME DES MINES DE SAN PEDRO. SPAIN.

Office: Rue de Chateaudun, 39, Paris, France Mine office: Zalamea La Real, Huelva, Spain. Don Carlos Marchal, agent. Capitalization, 450,000 francs. Lands include the Barranco de los Buyes group of 10 old mines, area 167 hectares.

SAN PEDRO COPPER CO. NEW MEXICO.

Mine office: San Pedro, Santa Fé Co., N. M. Idle for several years.

COMPAÑIA MINERA DE SAN PEDRO DE NOLASCO. CHILE.

Mine office: San Pedro de Nolasco, Victoria, Chile. Owns the Carlotta mine, opened A. D. 1795, which is developed by a 700' tunnel.

MINA SAN PIO. MEXICO.

Office: care of Spencer C. Richardson, owner, 40 Water St., Boston, Mass. Is located 12 hours' horseback ride southwest of Ameca, Jalisco, Mex.

MINA SAN PLATON. SPAIN.

Office: care of Don Antonio Ruiz Cancela, Sevilla, Spain. Mine office: Almonáster, Huelva, Spain. Lands, 46 hectares. Idle for several years.

SAN RAFAEL COPPER MINING CO. MEXICO.

Letter returned unclaimed from former office, Tucson, Ariz. Mine office: Hermosillo, Sonora, Mexico. Organized under laws of Arizona, with capitalization \$1,500,000. Lands, 200 pertenencias, including the Randolph and other mines, 16 miles northeast of Hermosillo, having about 1,100' of development work. Company was said to plan building a smelter, to have 2 reverberatory furnaces.

SAN RAFAEL MINING CO. MEXICO.

Office and mine: Ameca, Jalisco, Mexico. Lands, sundry claims, circa 21 miles west of Ayutla, two days' ride by trail from Ameca, lying on the eastern slope of the Cacoma ridge. Topography is rugged, and claims are well located for development by tunnel. The mountains show a wide belt of parallel veins, with quartz gangue, traversing diorite. Mine is an antigua, carrying values mainly in lead, zinc and silver. Equipment includes a water power installation, 5-stamp mill, cyanide plant and patio.

SAN FEMO COPPER CO. ARIZONA.

A spectral corporation, organized under the laws of West Virginia, as the astral body of the Copper Belle Mining Co., with capitalization \$300,000, later increased to \$2,000,000, without the knowledge or consent of the shareholders, which once had, or was supposed to have had, some sort of a claim to

three claims of some sort, in the Dragoon Mountains, Cochise county, Arizona. Diaphanous.

HACIENDA DE SANTA BARBARA.

PERÚ.

Works office: Yauli, Junin, Perú. Dr. O. Valentine, manager; B. F. Slater, superintendent. Property is a reduction plant, located 6 miles from Morococha by trail, and circa 25 miles from the same point by rail. Ore is delivered by llamas, carrying 100 to 110 pounds each, at a freight rate of \$2 to \$2.50 per ton, with which rate the railroad, owing to heavy grades and heavy capitalization, cannot compete. Equipment includes a 20-ton Krupp ball mill, jigs, spitzkasten, centrifugal separators, centrifugal dryer, 6' pulp-mill and a Van Meter oil concentrator. Plant is operated by a 60-h. p. turbine.

MINA SANTA BEATRIZ.

MEXICO.

Mine office: care of Richard Pearce, superintendent, Magdalena, Sonora, Mexico. Has steam power. Presumably idle.

SANTA CECILIA COPPER MINING CO., LTD.

Wound up, July, 1901.

SANTA CRUZ COPPER CO.

MEXICO.

Mine office: Santa Cruz, Arizpe, Sonora, Mexico.

SANTA CRUZ MINING CO.

ARIZONA.

Office: 368A Live Stock Exchange, Kansas City, Mo. Mine office: Patagonia, Santa Cruz Co., Ariz. Employs 25 men. W. W. Hall, president; W. B. Barnes, vice-president; Geo. W. Bolen, secretary and treasurer; Wm. M. Schwartz, general manager; J. A. Tustin, superintendent. Organized October 5, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par.

Lands, 6 claims, area 124 acres, in the Harshaw district, showing several fissure veins, of about 20' average width, giving a general average assay of 8.5% copper, 20 oz. silver, 5.09% nickel and \$25 gold per ton, mainly from chalcocite. Development is by 2 shafts, deepest 150', at last accounts, but supposed to be sinking for the 500' level. Mine was discovered 1860, opened 1890, reopened 1900, and after a period of inactivity work was resumed January 1, 1906. Management considered good, and property of promise.

SANTA EMILIA COPPER CO.

MEXICO.

Office: 69 Wall St., New York. Mine office: Coapa, Michoacán, Mexico. Employs 60 men. A. J. Peyton, president and general manager; Geo. W. Lockwood, vice-president; Manuel L. Ward, secretary and treasurer; Jos. G. Collinson, superintendent; J. R. Crum, engineer. Organized 1899, under laws of Delaware, with capitalization \$1,000,000, and reorganized January, 1905, under laws of Maine, with capitalization \$2,000,000, shares \$1 par. Of the increase in stock, \$500,000 was given shareholders as a stock dividend, and \$500,000 in shares placed in the treasury, for development purposes.

Lands, 113 acres, in the Tacambara district, including a 30-acre property adjoining the original tract, taken over from the president and paid for in shares from the new treasury stock. Property is 24 miles from nearest station on the Mexican National Railroad, but A. J. Peyton & Co. are said to be building a railway to within 3 miles of the mines. Principal development is by the Napoleon tunnel, 1,200' long, and by a 600' 2-compartment shaft. Equipment

includes a good steam plant, mine buildings, and accommodations for workmen. At last accounts mines were undergoing development, without showing ore in payable quantities, but conditions were considered encouraging, by the management.

SANTA EULALIA MINING & MILLING CO.

MEXICO.

Office: 12 State St., Chicago, Ill. Mine office: Velardeña, Durango, Mex. Conrad Auw, president; Henry Grant, secretary; Wm. J. Auw, manager. Has a 325' main shaft and a 220' tunnel, developing ores of lead, copper, gold and silver. Has gasoline power. Employed circa 100 men, at last accounts.

MINA SANTA FÉ.

MEXICO.

Mine office: Teapa, Tabasco, Mexico. This mine, formerly held by the Chiapas Mining Co., is developed by a 1,560' tunnel and a 200' main shaft, showing a mineralized zone of circa 100 meters width, as a contact vein between diorite and limestone, apparently formed by contact metamorphism. Values are mainly in argentiferous and auriferous copper ore, but the ore is very complex, carrying cuprite, malachite, bornite, chalcophyrite, tetrahedrite, chrysocolla, sphalerite, galena, and free gold, associated with iron pyrites, with a gangue that is mainly wollastonite, a silicate of calcium. The best grade of concentrating ore is mainly bornite, disseminated in a gangue of wollastonite and garnet crystals. Property has water power, a 30-stamp mill, 100-ton concentrator and 75-ton smelter, and in 1903 made 168,050 kgs. fine copper.

SANTA FÉ GOLD & COPPER MINING CO.

MEXICO.

Mine offices: Alamos, Sonora, Mex., and El Fuerte, Sinaloa, Mex. Is controlled, through stock ownership, by International Copper & Gold Co. Lands, 8 groups, in the states of Sonora and Sinaloa. La Josefita group, area 50 hectares, in Sonora, near the Sinaloa line, is said to show an 80' ore body, giving assays of 25% to 28% copper, with a good surface showing. It is planned to develop this group by quarrying. La Australia group, 20 claims, near El Fuerte, Sinaloa, is opened by a 70' two-compartment shaft, showing a 1' paystreak of bonanza ore, assaying 15% copper and 1,212 oz. silver per ton. La Sorteo group, 10 pertenencias, 7 miles from San Bernardo, has a 30' vein, opened by a 150' tunnel, giving good assay values in gold, silver and copper. El Negro group, 14 pertenencias, carries gold and silver. The Piedregal group, 15 pertenencias, is a little east of El Negro. La Higuera group, 8 pertenencias, in Sonora, shows a 16' paystreak in a 50' vein, carrying mainly silver values. El Niño group, 10 pertenencias, 30 miles southwest of San Bernardo, gives good assay values in gold, silver and lead. The Zacatecas group, 10 pertenencias, carries gold.

SANTA FÉ GOLD & COPPER MINING CO.

NEW MEXICO.

Office: 11 Broadway, New York. Mine office: San Pedro, Santa Fé Co., N. M. Idle. J. H. Susmann, president; E. H. Westlake, secretary and treasurer; Organized 1899, under laws of New Jersey, with capitalization \$2,500,000, shares \$10 par, as a reorganization of the original Santa Fé company, formed 1888, and bankrupt 1892. Present company began business with \$500,000 cash; balance of assets, Jan. 1, 1905, was \$150,286.24.

Annual meeting, fourth Tuesday in January. State Street Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent.

Lands, 3,400 acres mineral property and 46,000 acres miscellaneous lands, latter including coal areas of promise, all in the old San Pedro land grant. Mine is opened by a single shaft, on a blanket vein of sulphide ore 150' to 175' thick, dipping at an angle of less than 15°. About half the ore body is workable, though low in grade. Ore smelted, 1901, gave average returns of 4.75% copper, \$1.50 silver and \$1.50 gold per ton, slags showing about 0.5% copper only. It has been alleged that mining and smelting costs were about \$7 per ton of ore, but this figure undoubtedly is too low. Ore is silicious, requiring heavy iron and lime fluxes. The mine is said to have ore reserves of about 30,000 tons, blocked out.

The smelter, with two 125-ton furnaces, was blown in Jan. 1, 1901, and blown out in the following November. The mine and smelter are 21 miles from the Santa Fé Central Railroad, with survey made for a connecting line. Much trouble was experienced in smelting, from shortage of coke supply and inadequate transportation facilities. To operate the property to advantage, ore should be concentrated, to obviate the smelting of an immense amount of barren material, in both ore and fluxes, and proper railroad connections are imperatively demanded for profitable operations. The only work done, since 1902, has been the boring of 543' of diamond drill holes. It has been said that the ore was worked out, but this does not seem possible. Property is considered promising, if given good transportation facilities.

SANTA FÉ MINING & REDUCTION CO.

NEW MEXICO.

Letter returned unclaimed from alleged mine office, Santa Fé, N. M.

COMPAÑIA SANTA INES y MOROCOCHA.

PERÚ.

Office: 193 Calle de Aparicio, Lima, Perú. Mine office: Morococha, Junin, Perú. Employs 120 men. Roberto Pflucker, president; Leopoldo Pflucker, vice-president; Porfirio Silva, secretary and treasurer; Vicente Pazos y Sacio, general manager; León Torres, mine superintendent. Organized under laws of Perú, with capitalization 1,200,000 sols.

Lands, 120 mining claims, area 240 hectares, also the Hacienda Morococha, area 56 square kilometres, in the Tuctu district of Yauli, Junin, Perú. Mining lands carry sundry fissures and contact veins between diorite and limestone, these averaging about one metre in width and carrying values up to 25% copper, with average returns of circa 16% copper and 16 oz. silver per ton, from sulpho-arsenide ores of copper. The mines are opened by the Ausiliar tunnel of 300 metres, La Media Falda tunnel of 600 metres, and La Laguna tunnel of circa 800 metres length, with a total of about 3,000 metres of underground openings, estimated to show about 20,000 tons of ore, blocked out for stoping. Mine is operated by electricity, furnished by a 40-kw. Siemens & Halske generator, with 3 electric drills, and is served by the Ferrocarril Central de Perú, tracks of which touch the mine.

Country coal, costing about \$9 per ton, is used for fuel, and cost of mining is given by company as averaging about \$2.50 per ton. Product is dressed to an average copper tenor of about 25% and sold to the Casapalca

smelter for reduction. Production, 1905, was circa 3,600 metric tons of ore, carrying about 2,000,000 lbs. fine copper. Company planned building a 100-ton smelter, but at last accounts the property was under option to Messrs. Haggin & McKim, presumably for the Cerro de Pasco company.

MINA SANTA MARIA.

HONDURAS.

An undeveloped property at Comayagua, Honduras, asserted to be a mountain of ore, ten miles in circumference, assaying 10% to 75% copper, which is a pretty stiff claim.

COMPAÑIA MINERA SANTA MARIA DE LA PAZ.

MEXICO.

Office: 10 Cinco de Mayo, San Luis Potosí, S. L. P., Mex. Mine office: Matehuala, S. L. P., Mex. Pedro Barrenchia, president; Rafael G. Barrenchia, secretary; W. B. A. Dingwall, manager; José Torres, superintendent. Mines, extensively developed, carry auriferous and argentiferous lead and copper ores. Has steam, electric and gas power, Chilean mills, Blake crushers, smelter with two 40-ton furnaces, and a 300-ton concentrator. Employs circa 1,500 men, and is a considerable producer of lead and silver, with smaller by-products of gold and copper.

SANTA MARIA MEXICO MINING ASSOCIATION.

MEXICO.

Office: Merrill Bldg., Milwaukee, Wis. Mine office: Parral, Chihuahua, Mexico. Employs 15 men. Wm. G. Gruber, president and general manager; Arthur H. Gruber, secretary and treasurer; preceding officers and Rev. Alois Plut, directors; Dr. Chas. Yetmar, vice-president; A. S. Mitchell, consulting engineer; Henry Bitsch, superintendent. Organized under laws of Wisconsin, with capitalization \$250,000, shares \$1 par, and is conducted as a close corporation.

Lands, 50 claims, in 3 groups, known as La Lolita, La Viola, and Santa Clara, located in the Galeano district of Chihuahua, in the San Blas mountains of the Sierra Madre range, 60 miles south of El Paso, midway between and 25 miles from the Mexican Central and Sierra Madre Pacifico railways. Principal development is on La Lolita group, which has shafts of 75' and 150', showing rich oxidized ores, assaying up to 70% copper, shipments from which have averaged 15% copper. In June, 1906, had 260 tons of high grade ore ready for shipment. Company plans installing a power plant.

SANTA RITA COPPER MINING & SMELTING CO.

ARIZONA.

Disappeared from former office, 1609 Chemical Bldg., St. Louis, Mo. Organized June, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Changed officers repeatedly, and was a mere stock-jobbing scheme. Lands claimed were in the Tindall district, Santa Rita Mountains, 38 miles south of Tucson, Arizona. Fully described in Volume V.

SANTA RITA MINING CO.

NEW MEXICO.

Office: 85 Ames Bldg., Boston, Mass. Mine office: Santa Rita, Grant Co., N. M. Employs circa 100 men. Albert C. Burrage, president; B. B. Thayer, consulting engineer. Capitalization \$5,000,000, shares \$25 par. Is said to contemplate reduction of capitalization to \$2,000,000. Paid a dividend of 50 cents per share, amounting to \$100,000, in 1904.

Lands, 79 claims, 46 patented, area circa 640 acres, near Santa Rita. Is the oldest copper mine in New Mexico, and one of the oldest in the United States, having been opened A. D. 1800. The mine was abandoned, circa 1820, owing to the Mexican revolution, and was reopened, circa 1860. Development is by numerous shallow shafts, No. 8 shaft, with two compartments, is 214' deep, and is carrying stopes on 8 drifts. No. 9, a 2-compartment shaft, started 1906, is to be sunk to 300'.

Equipment includes a 180-ton concentrator, supplied with rolls and Wilfley tables.

Company is exceedingly secretive, for reasons best known to the management, but is supposed to be closely allied with the Amalgamated Copper Co. Production was one carload of ore daily, at last accounts, and production, for 1905, is estimated at 2,000,000 lbs. fine copper, largely secured by leasers.

SANTA ROSA COPPER CO.

ARIZONA.

Lands sold, circa 1905, to Detroit Copper Mining Co., of Arizona.

SANTA ROSA DEVELOPMENT CO.

MEXICO.

Letter returned unclaimed from former office, Douglas, Ariz. Mine office: Santa Rosa, Sonora, Mex. Chas. A. Overlock, president; D. E. Heller, vice-president; Thos. A. Rendle, secretary and general manager. Organized September, 1903, under laws of Arizona, with capitalization \$100,000, shares \$10 par. Lands, 136 pertenencias, in the Arizpe district, about 15 miles south of Douglas and 3½ miles from the Nacozari railroad, showing three contact veins between porphyry and limestone, developed by 5 shafts and 5 tunnels. Ores carry good values in copper, lead and silver, with small gold values, assays having been secured up to 37% copper, 35% lead and 20 oz. silver per ton. Has a 25-h. p. gasoline hoist and 50-h. p. gasoline air-compressor. Idle.

SANTA ROSA DE MAZAPIL MINING CO.

MEXICO.

Office: 20 Broad St., New York. Mine office: Mazapil, Zacatecas, Mex. Has gold, silver, lead and copper ores, developed by a 1,500' tunnel and sundry shafts.

MINA SAN TELMO.

SPAIN.

Owned and operated by Sociedad Colectiva Ibarra Hermanos.

MINA DE SANTIAGO.

MEXICO.

Letter returned unclaimed from former mine office, El Fuerte, Sinaloa, Mexico.

SANTIAGO COPPER MINING CO.

CUBA.

Succeeded, circa 1902, by El Cobre Mines.

SANTO DOMINGO MINING CO.

MEXICO.

Office: care of W. B. Davis, president, Guadalajara, Mexico. W. M. Mathews, vice-president and general manager; Rufus P. March, secretary and treasurer; Austin G. Brady, comisario; Chas. H. Brooks, superintendent. Organized February 23, 1906, with capitalization \$5,000,000, and is organized under laws of Mexico also, as Santo Domingo Mining Co., S. A.

Property is the Santo Domingo group, in the Hostotipaquillo district

of Jalisco, and the Iguana mine, in the Etzatlán district of Jalisco. The Santo Domingo group includes 11 properties, mainly antiguas, area 166 acres, said to show a large amount of ore blocked out. New development is by shaft and tunnel, said to show ore worth \$35 to \$40 per ton, to the value of \$900,000, these figures presumably being in Mexican currency.

SANTO DOMINGO SYNDICATE.

SANTO DOMINGO & HAITI.

Office: care of E. A. Blanton, Jr., general manager, The Bourse, Philadelphia, Pa. Mine office: San Cristobal, Santo Domingo. Capt. J. R. De Lamar, E. P. Earle, G. P. Lindermann, L. H. Taylor, Jr., W. T. White, Geo. R. Radford, T. C. Hall and E. T. Lavino, directors. Organized under laws of New Jersey, with capitalization \$100,000. Lands, 100 square miles, in the republics of Haiti and Santo Domingo. The San Francisco Hills mine, near San Cristobal, Santo Domingo, is said by Mr. Blanton to show a body of chalcopryite of 500' width, carrying 5% to 20% copper, and \$1 to \$12.50 gold per ton. Early in 1906 a hoist and pumps were being installed, and in March, 1906, the company had about 1,000 men building a 42" gauge railroad to the mine, which it was hoped to complete during the year.

SANTO NIÑO MINING CO.

MEXICO.

Letters returned unclaimed from former office, Monterey, N. L., Mex., and former mine office, Symon, Dgo., Mex.

SAN TORINO MINES.

GREECE.

Letter returned unclaimed from former mine office, San Torino, Greece. Is owned by an Austrian company, of Trieste. Ores are oxides and carbonates. Idle for several years.

SAN TOY MINING CO.

MEXICO.

Office: 1314 Wells Bldg., Milwaukee, Wis. Mine office: Santa Eulalia, Chihuahua, Mexico. Sylvester T. Everett, president; Josiah Quincy, vice-president; A. S. Witherbee, secretary and treasurer; R. G. Morambert, manager. Organized under laws of Maine, with capitalization \$2,500,000, shares \$1 par. Control is said to have been bought, early in 1906, by residents of Pittsburg, who planned extensive work.

Lands, 5 groups of claims, on which considerable development has been secured, the old mine openings from a previous ownership aggregating nearly 10 miles length. Ore is low in grade, carrying mainly silver values, with a little copper only, with excess of iron. Company claimed to have 200,000 tons of ore in sight, that would give returns of about \$8 per ton; but probably both quantity and quality of ore were overestimated.

SAN XAVIER COPPER CO.

MEXICO.

Office: care of Wm. Foster, secretary, Tucson, Ariz. Branch office: care of Max Muller, treasurer, Hermosillo, Sonora, Mexico. Mine office: San Xavier, Sonora, Mexico. C. C. Rountree, president; Gorge Grunig, vice-president. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Mexican incorporation is the Compañía Minera de Cerro Verde. Lands, 1,440 pertenencias, 80 miles east of La Colorada, also 300 pertenencias lying 24 miles to the southward, and circa 4 miles north of the Yaqui river.

SAPHO MINING CO.**NEVADA.**

Mine office: Ely White Pine Co., Nev. C. P. Webber, manager, at last accounts. Mine shows auriferous oxidized ores, assaying 6% to 22% copper, with paystreak running about \$30 gold per ton. Has steam power.

SARATOGA PYRITIC SMELTING CO.**COLORADO.**

Office: 204 California Bldg., Denver, Colo. Mine office: Iron-ton, Ouray Co., Colo. Ores carry gold, silver, lead and copper. Has steam power.

SASAGATINI MINE.**JAPAN.**

Mine office: Hatazako-mura, Kanoashi-gori, Iwami, Japan. Has slightly argentiferous chalcoppyrite, associated with sphalerite, galena and arsenopyrite, with quartz and limestone gangue, in numerous contact veins ranging up to 50' in width. Production, 1900 was 62,961 momme silver and 274,412 lbs. fine copper.

SATER COPPER CO.**NEW MEXICO.**

Office: 1512 Farmers Bank Bldg., Pittsburg, Pa. Mine office: Kenton, Oklahoma. Chas. L. Medbury, president; Dr. W. W. Wolfe, vice-president; Geo. W. Charles, secretary and treasurer. Organized December 19, 1903, under laws of New Mexico, with capitalization \$2,500,000, as a reorganization of the Copper Chief Mining Co., which came to grief, and was reorganized under present title, by Jared Sater, who was president of the Sater Copper Co., until ousted by shareholders, at the annual meeting, March, 1906.

Lands, 27 claims, area 540 acres, also a 5-acre millsite, in the Black Mesa district of Union county, New Mexico. Country rock is sandstone, said by company to show 7 fissure veins, of which 2, under development, are claimed to average 6' width and to carry an average of 14% copper and 15 oz. silver per ton, in melaconite, malachite, azurite, bornite and chalcoppyrite. Development is by shafts of 85' and 225', and by tunnels of 25', 50' and 300', estimated by company to show 60,000 tons of ore, which is excessive. Has a 190-h. p. steam plant, and 2 hoists, with 4 mine buildings and an 18x70' mill. Nearest railroad is 33 miles distant.

Jared Sater was dropped from the management at the last election, and promptly begun litigation, ending in the appointment of a receiver, circa April, 1906. Milton Sater accuses Jared Sater, and 5 other members of the Sater family, of all sorts of schemes and rascalities. Apparently the company was not born right, and can best serve the world by an early demise.

SAUK RIVER MINING CO.**WASHINGTON.**

Office: 327 Pacific Blk., Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. Harold G. Price, president and treasurer; Wm. Van Waters, secretary. Organized 1898, under laws of Washington, with capitalization \$200,000, shares 50 cents par. Lands, 9 claims, area 180 acres, in three groups, carrying 3 veins of auriferous and argentiferous copper ore. Vein at Blue Bird group is claimed to be 98' wide, between porphyry and slate, carrying 3 paystreaks, of 2', 4', and 6', balance of vein being a low-grade self-fluxing concentrating ore. Idle at last accounts.

SAULT GRAY COPPER CO.**ONTARIO.**

Absorbed, circa 1903, by Copper Queen Mining Co., Ltd.

SAULT PROSPECTING & DEVELOPMENT CO.**ONTARIO.**

Succeeded, circa 1903 by Copper Queen Mining Co., Ltd

SAUX HEAD COPPER MINING CO., LTD.**MICHIGAN.**

Office: 36 Home Bank Bldg., Detroit, Mich. Mine office: Marquette, Marquette Co., Mich. Employs 8 men. Chas. A. Stringer, president and general manager; Frank M. Moore, vice-president; J. G. Krieg, secretary; Chas. M. Miller, treasurer; preceding officers and Geo. R. Purdon, directors; Frank E. Krieg, mine superintendent. Organized August 13, 1902, under laws of Michigan, with capitalization \$2,500,000, shares \$1 par; issued, \$1,825,000.

Lands, 360 acres, owned in fee, in the Sauk's Head district, northwest of Marquette, 2 miles from the Lake Superior & Ishpeming railway, showing 2 ore bodies, said by company to occur as impregnations in granite and diorite, but stated by other authorities to be gash veins in granite, these ranging 4' to 8' in average width, giving assays of 1% to 4% copper and \$2 to \$200 gold per ton. Development is by shafts of 50' and 170', and by tunnels of 30', 40' and 70'. Has steam power with 2 donkey hoists, a 5-drill Ingersoll air-compressor and 4 power drills. Has 7 buildings, including a 15x20' machine-shop, store, office and dwellings.

SAVAGE GOLD & COPPER CO.**ARIZONA.**

Offices: 625 Noble St., Chicago, Ills., and Douglas, Ariz. Mine office: Paradise, Cochise Co., Ariz. Employs 25 men, mainly Mexicans. F. M. Wajtalewicz, president; J. A. Lewandowski vice-president and general manager; C. R. Temple, secretary; A. P. Behnke, treasurer; Lewis Roberts, consulting engineer; Jas. Reay, superintendent. Organized January 6, 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Annual meeting, first Tuesday in November.

Lands, 43 claims, area 860 acres, in the California district, lying in the eastern foothills of the Chiricahua Mountains, next the San Simon valley, 10 miles from Rodeo, the nearest railroad station. Property shows 5 irregular ore bodies, apparently lenses, in contact zones between limestone and porphyry, of which 4, under development, are of 2' to 36' width, giving assays of 5% copper, 1% lead and from nothing to 30 oz. silver per ton, lead values being from occasional galena. Development is by shafts of 50', 65', 100', 65' and 40', and by a 400' tunnel, with a total of 1,355' of workings.

Equipment includes necessary mine buildings and is to include a smelter with a 50-ton cylindrical water-jacket blast-furnace. This was to have been blown in, May, 1905, but in April, 1906, the furnace had not been erected, though the material was on the ground.

SAVAGE GOLD & COPPER MINING CO. COLORADO, NEW MEXICO & WYOMING.

Office: Cripple Creek, Colo. Capitalization \$1,500,000, shares \$1 par. Lands, 4 fractional gold claims, area 12 acres, in the Cripple Creek district. Teller county, Colorado; sundry claims in the Santa Rita district, Grant county, New Mexico, and claims in the Battle Lake district, Carbon county, Wyoming. The Cripple Creek property is under lease to T. H. Thomas,

and the copper properties, in New Mexico and Wyoming, latter considered well located, are idle, as management prefers waiting to going in debt.

SAVANIC MINE.**ARIZONA.**

Office: care of Col. H. L. Pickett, St. George, Utah. A partly developed mine, in the northern part of Mohave county, Arizona, nearest town being St. George. Shipped 14 carloads of copper ore to Salt Lake smelters, averaging 39% copper, this being hauled 140 miles by wagon and 300 miles by rail. Erection of small smelter, on the banks of Virgin river, has been tentatively considered. Property is promising, but is almost inaccessible, at present.

SAWATARI MINE.**JAPAN.**

Owned by Mitsu Bishi Goshi-Kwaisha.

SAYLER MINE.**CALIFORNIA.**

Letter returned unclaimed from former mine office, Garlock, Cal.

SCANLAN MINE.**ARIZONA.**

Office and mine: care of L. H. Scanlan, owner, Paradise, Cochise Co., Ariz. Lands, 12 claims, opened by a 125' incline shaft, said to be bottomed in a 30' vein of chalcopryite, and by a tunnel, 175' long at end of 1905, planned to cut the ore body at a distance 400', giving a back of 325'.

SCANTIC GOLD MINING & MILLING CO.**COLORADO & MEXICO.**

Office: 206 Continental Bldg., St. Louis, Mo. Mine offices: White Cross, Hinsdale Co., Colo., and Charcas, San Luis Potosí, Mex. John H. Hammond, Denver, president and general manager; W. F. Smith, superintendent of Colorado property, which has steam power, and is developing ores of gold, silver, copper and lead. Joseph T. Murphy, manager of Mexican property, which includes the San Sebastian and extensions, carrying silver, lead and copper, equipped with a 25-ton concentrator, employing circa 100 men, at last accounts.

KUPFERKIESBERGBAU SCHATTBURG.**AUSTRIA.**

Mine office: Schattberg, Tyrol, Austria. Is a very small producer.

GEWERKSCHAFT SCHLESISCHE NICKELWERKE.**GERMANY.**

Mine office: Gläsendorf, Schlesien, Germany. Lucien Pierron, president; W. Woltman, smelter superintendent. Lands include 7 properties developed by shallow shafts. Employed circa 300 men, and produced 60 tons daily of cupriferous nickel ore, at last accounts.

SCHUYLKILL COPPER CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Chloride, Ariz.

SCOTIA MINING & MILLING CO.**WASHINGTON.**

Office: Spokane, Wash. Letter returned unclaimed from former mine office, Bossburg, Stevens Co., Wash. Ores carry gold, silver and copper.

SCOTTISH-AUSTRALIAN COPPER CORPORATION, LTD.

Organized Jan. 14, 1904, under laws of Guernsey, with capitalization £200,000, shares £1 par.

SCOTTISH-AUSTRALIAN MINING CO., LTD.**AUSTRALIA.**

Offices: Winchester House, London, E. C., Eng. G. T. Rait, chairman; H. F. Chilcott, mine manager; F. W. Turner, secretary. Organized Jan. 6, 1859, with capitalization £250,000, shares £1 par. Is an old and successful

company, paying dividends of 2% to 10% annually. Works two collieries, at Newcastle, New South Wales, and has mineral lands carrying copper, near Rockhampton, Queensland, latter under option of purchase to an exploring syndicate.

SCOTTISH-CAUCASIAN COPPER SYNDICATE, LTD.

Offices: 55, West Regent St., Glasgow, Scotland. Organized May 30, 1902, with capitalization £2,000, shares £1 par; issued, £875.

SCOTTISH CHIEF MINE.

UTAH.

Mine office: Park City, Summit Co., Utah. W. L. Lawrence, manager, at last accounts. Main shaft, 325'. Ore values are mainly in silver and lead, with 1% to 7% copper and 40 cents to \$1.50 gold per ton.

SCOTTISH COPPER MINES SYNDICATE

BRITISH COLUMBIA.

OF BRITISH COLUMBIA.

Dead. Letters returned unclaimed from all former offices.

SEABOARD COPPER CO.

VIRGINIA.

Office: 77 South Market St., Boston, Mass. Mine office: Virgilina, Halifax Co., Va. Idle. M. A. Packard, president; H. J. Sampson, vice-president; Edward L. Pond, secretary; C. C. Merritt, treasurer; preceding officers, Geo. F. Tarbell and R. T. Lincoln, directors; L. W. Tucker, general manager; Lee McCarn, superintendent. Organized July, 1902, under laws of New Jersey, with capitalization \$300,000, shares \$1 par.

Lands, 135 acres, including the Dorothy and Bailey mines, in the Virgilina district, 3 miles from the Southern Railroad, showing a country rock of slate, traversed by a fissure vein of 8' estimated width, carrying cuprite, malachite and azurite in the upper part, with bornite below, giving estimated values of 3% to 4% copper, with combined gold and silver values of \$1 to \$1.20 per ton. Development is by shafts of 30', 265' and 115', and by 2 tunnels, of 165' each, with a total of 840' of underground workings, estimated to show 40,000 tons of ore, with 10,000 tons blocked out for stoping, and with 3,000 tons on the dumps, ready for milling. Equipment includes a 275-h. p. steam plant, with a 25-h. p. Lidgerwood hoist, good for 500' depth, and a 5-drill Ingersoll-Sergeant air-compressor. Buildings include an office, bunk-house and engine-house. Company plans resuming development and erecting a 50-ton concentrator, for which plans are completed, with much of the heavy machinery in place.

SEAGER-CORYELL GOLD & SILVER MINING CO., LTD.

IDAHO.

Office: Phillipsburg, N. J. Mine office: Custer, Custer Co., Idaho. John Eilenberg, president; Reginald Coryell, secretary and general manager. Organized January, 1900, under laws of New Jersey, with capitalization \$100,000, shares \$1 par. Lands, 9 claims, area 170 acres, in the Yankee Fork district, showing several veins, with about 1,500' of underground development, one claim showing azurite, malachite, melaconite and chalcopryrite, assaying 3% copper, with fair gold and silver values. Idle.

SEAL BAY MINE.

NEWFOUNDLAND.

An old and idle mine, in Newfoundland. Deepest workings, 120'.

SEATON MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Idaho Springs, Colo.
SEATTLE-BOSTON COPPER CO.

WASHINGTON.

Office: 419 Alaska Bldg., Seattle, Wash. Mine office: Skykomish, King Co., Wash. Employs 20 men. Chas. E. Crane, president and general manager; Dr. F. A. Churchill, vice-president; Geo. H. Law, secretary; Martin B. Crane, treasurer; preceding officers and A. M. Brooks, directors; A. J. Walters superintendent; Jas. Cosgrove, mine superintendent. Organized September 19, 1905, under laws of Washington, with capitalization \$2,000,000, shares \$1 par, divided into \$600,000 preferred 8% stock and \$1,400,000 common stock, latter issued in payment for the property, and held in escrow.

Lands, 20 claims, area 400 acres, also a 120-acre millsite, in the Burns district, 11 miles south of the Great Northern railway. Country rock is syenite, showing 12 fissure veins, of which three, under development, are of 18' reported average width, opened by a 65' shaft and by tunnels of 70', 35' and 60', estimated to show 20,000 tons of chalcopryite, with 5,000 tons blocked out for stoping, and 1,500 tons on the dump, carrying average values of 16% copper, 3% zinc, 6 oz. silver and \$2 gold per ton. Company is said to have placed an order for a 500-ton Bleichert aerial tramway, a 250-kw. Westinghouse electric generator, a 100-h. p. hoist, good for 1,000', and a 10-drill electric air-compressor. There are 5 buildings at the mine. Company is building a private railway, known as the Seattle-Boston Railroad, length 6.5 miles, which is to have a 200-h. p. Westinghouse electric locomotive. It is planned to utilize electricity as the motive force, throughout the mine and works. The company is said to be backed by good people, and hopes to begin production by December, 1906.

SEATTLE GOLD & COPPER MINING CO.

Letter returned unclaimed from former office, Seattle, Wash.

SEATTLE MINE.**BRITISH COLUMBIA.**

Office: Trail, West Kootenay District, B. C. Has a 340' tunnel, showing a 3' vein of good copper ore. At last accounts was under bond to Pemberton & Hunter, who were developing the property.

SEARCHLIGHT COPPER-GOLD MINING CO.**NEVADA.**

Office: 250 Wilcox Bldg., Los Angeles, Cal. Mine office: Searchlight, Lincoln Co., Nev. J. W. Calkins, president; J. J. Lonergan, secretary; Chas. Van Ina, manager. Lands, 7 claims, including the Oom Paul group, said to carry a vein of 5' to 7' width, and 4,000' length, opened by a 200' shaft, showing ore giving assays of 10% copper and \$20 and upwards gold per ton. A carload shipment, 1902, to Los Angeles gave returns of better than \$50 gold per ton.

SEDALIA COPPER CO.**COLORADO.**

Leased lands, for 10 years, to Salida Gold & Copper Mining Co. Lands now held, under option, by Shawmut Consolidated Copper Co.

SELBY SMELTING & LEAD CO.**CALIFORNIA.**

Office: 416 Montgomery St., San Francisco, Cal. Mine office: Selby, Contra Costa Co., Cal. Employs 500 men. A. J. Ralston, president; H. B.

Underhill, Jr., secretary; Alfred von der Ropp, superintendent; John Chase, purchasing agent. Organized 1875, under laws of California. Control of stock was secured, 1905, by American Smelters Securities Co.

The company has an extensive smelting and refining plant, equipped with steam and electric power, at Vallejo Junction, near Carquinez Strait, the site of the smelter being somewhat circumscribed. Ore is received by rail and water, the works drawing ore supplies from all of the Pacific states. The smelter has 4 blast-furnaces, including both lead and copper stacks, and also operates a lead refinery and a plant for parting gold and silver, and incidentally manufactures copper sulphate. Fuel is coal, coke and petroleum.

SELKIRK MOTHER-LODE COPPER MINES, LTD. BRITISH COLUMBIA.

Letter returned unclaimed from former office, London, Eng.

SEMINOLE COPPER MINING CO.

GEORGIA.

Dead. Property sold, 1904, by the sheriff, to Carl Henrich, for \$33,000.

SEMINOLE MINE.

GEORGIA.

Office and mine: care of Carl Henrich, owner, Metasville, Wilkes Co., Ga. Employs 18 men. Property, held formerly by Seminole Copper Mining Co., was sold at sheriff's sale, July, 1904, to Mr. Henrich, for \$33,000.

Lands, 901 acres, freehold, including the Magruder mine, well timbered with pine, cedar, and hardwood, in Lincoln county, Georgia, 12 miles from the Georgia Central railroad. Country rock is pre-Cambrian schist, intruded by eruptive dikes of two different ages, carrying numerous fissures in schists and contact veins between schist and eruptive rocks, ore bodies occurring in four nearly parallel veins, with other unexplored ore bodies existing and with 5 ore bodies under development. Openings include shafts of 90', 150' and 245', with a total of 1,500' of workings, estimated to have blocked out 1,000 tons of ore for stoping, in veins of 2' to 12' width, carrying chalcopryrite and galena, with estimated average values of 3% to 4% copper, 5% to 12% lead, 2.5% zinc, 5.5 oz. silver and \$3 gold per ton. The old main shaft was badly caved in, but has been reopened, retimbered and new pumps installed. The property was opened circa 1852, closed 1862, on account of the American Civil War, and was reopened in 1878, 1899, and 1905.

Mining equipment includes 12-h. p. and 15-h. p. hoists, good for 500' each, and a 4-drill Rand air-compressor. Buildings include a 20x30' smithy, a small machine shop and a small concentrator and smelter. The concentrator, 30x65', of wood, has 1 Gates crusher, 1 set of rolls, 1 Twentieth Century jig and 2 Bartlett tables. The smelter has a small reverberatory furnace and a 15-ton rectangular water-jacket blast-furnace, making matte of 15% to 45% copper tenor.

A tram-line connects the mine and concentrator. The machinery plant has been overhauled, and worn-out parts replaced. Production, 1905, was only 8,800 lbs. fine copper, from 125 tons of ore treated, but the owner estimates 1906 production at 30,000 to 60,000 lbs. fine copper monthly. Cost of mining is \$2.50 to \$3.50 per ton, and cost of concentration is 70 cents per ton. Management is good, and property is considered promising.

SENECA MINING CO.

MICHIGAN.

Office: 301-199 Washington St., Boston, Mass. Operating office: Houghton, Houghton, Co. Mich. Albert S. Bigelow, president; William J. Ladd, secretary and treasurer; Norman W. Haire, general manager. Organized under laws of Michigan, with capitalization \$500,000, shares \$25 par. Lands, 1,880 acres, lying just north of the Mohawk and Ahmeek mines, in Keweenaw county, Michigan, the Ahmeek having been set off from the Seneca, in 1880. Two shafts were sunk, to a depth of circa 200' each, about 1880, since when no mining has been attempted. Developments to the east and south render it certain that the Kearsarge amygdaloid must underlie a considerable portion of the tract, the Seneca carrying the underlay of the Mohawk. Recent developments in the Mohawk mine are more promising, and indicate that the Seneca should carry good values in the Kearsarge lode.

In addition to the Kearsarge bed, the Seneca tract carries the extensions of the Calumet, Kearsarge and Allouez conglomerates, and the Osceola amygdaloid. The Kearsarge amygdaloid outcrops on the northeastern corner of the tract. The property is one of much promise, and doubtless will be developed in the future.

SOCIEDAD MINERA SERENA.

CHILE.

Mine office: La Serena, Coquimbo, Chile. Has steam power and employed circa 100 men, at last accounts.

SERRANO GOLD & COPPER MINING CO.

MEXICO.

Office: Main St., Danville, Pa. Mine office: care of T. H. Collins, general manager, La Cananea, Sonora, Mex. J. X. Grier, president; C. E. Yorks, secretary; M. I. Low, treasurer. Organized February, 1903, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Lands, 112 pertenencias, south of Cananea, carrying auriferous copper ores.

SERRAZANO COPPER CO., LTD.

ITALY.

Organized March 28, 1903, under laws of Guernsey, with capitalization £80,000, shares £4 par, to acquire copper mines at Serrazano, Italy.

SEVEN DEVILS MINING & DEVELOPMENT CO.

IDAHO.

Letter returned unclaimed from former office, 63 Devonshire St., Boston, Mass.

SEVILLE SULPHUR & COPPER CO., LTD.

SPAIN.

Offices: 30, George Square, Glasgow, Scotland. Spanish general offices: Patio de Banderas, Sevilla, Spain. Mine office: Aznalcóllar, Sevilla, Spain. Jas. Pipe, chairman; John Munro, secretary; John L. Macdougall, general manager; Robert Andrew, engineer; Capitalization £120,000, shares £10 par. Property, at the eastern end of the Sierra Morena, in the province of Sevilla, carries rich cupriferous iron pyrites, of good sulphur tenor, worked for years, by present company, with signal success. Production, 1905 was 2,867,200 lbs. fine copper.

SEYMOUR COPPER MINING CO., LTD.

BRITISH COLUMBIA.

Offices: 41, John Dalton St., Manchester, Eng. H. J. Challoner, secretary. Organized June 25, 1900, with capitalization £2,000, shares 5s. par, to ac-

quire copper properties at Seymour Narrows, Vancouver Island, British Columbia. Apparently moribund.

SHAFTER MINING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Arthur H. Roller, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam and electric power.

SHAMBLÜRGSKI WORKS.

RUSSIA.

Office: care of A. A. Broli, owner, Tiflis, Russia. Property includes sundry copper mines and a small smelter, in the Russian Caucasus.

SHANNON COPPER CO.

ARIZONA.

Office: 52 Broadway, New York. Mine office: Clifton, Graham Co., Ariz. Employs circa 500 men, largely Mexican labor. W. J. Palmer, president; Berthold Hochschild, vice-president; Meredith Hare, secretary; J. W. Hazen, treasurer; preceding officers, Chas. F. Brooker, A. A. Cowles, Dr. Leonard Wheeler and James Virden, directors; J. W. Bennie, general manager; H. H. Dyer, mine superintendent; Rollo B. Watson, engineer.

Organized Nov. 13, 1899, under laws of Delaware, with capitalization \$3,000,000, shares \$10 par. Bonds, \$420,000 outstanding, at 7%, being balance of \$600,000 issued, of which \$180,000 have been retired, in 3 annual installments of \$60,000, for which purpose of redemption the company places \$60,000 yearly in a sinking fund. Controls the Coronado Mining Co., through ownership of 51% of stock issue, and has leased the property of the Coronado for 4 years, until Oct. 8, 1908. Boston Safe Deposit & Trust Co., transfer agent; National Shawmut Bank, Boston, registrar. Has circa 1,300 shareholders.

Lands, 43 claims, area 400 acres, at Metcalf, in the Greenlee district, also 400 acres in mill and smelter sites. The Shannon has a side-line agreement with the Arizona Copper Co., by which extra-lateral rights are mutually waived, and all possibility of future litigation removed. Ore occurs as very irregular bodies, between limestone and porphyry, these having heavy gossan cappings of fairly good hematite, the oxidized ores favoring the limestone, while ore deposits of the porphyry side are mainly silicious sulphides, latter predominating. The mine shows oxide and carbonate ores of 4% to 10% tenor in the upper levels, and sulphide ores of 3% to 7% copper tenor in the lower workings, sulphide ores being mainly chalcopryite, with a little chalcocite. The mine is opened by shafts and tunnels, to a depth of 1,100' from the crest of the mountain, mine openings being timbered with 12x12" square sets. The mine has circa 8 miles of underground workings, with considerable ore reserves. There is some question as to whether ore values are holding at depth. The Little Coronado mine shows 3% to 5% copper. The Hanson tunnel is said to show an ore body of 180' width, averaging 6% copper. Open-cuts show iron ore carrying 2.5% copper, valuable for fluxing the silicious sulphides produced by the principal workings of the mine. The mine has two double-track working tunnels, of which one, 7x8' in size and 715' long, is connected with a 1,400' double-track incline tram leading to the Coronado railroad, with 6 ore-bins at either end, the tramway having an inclination of 36°. The incline has 10-ton cars, oper-

ated in counterbalance, with a retarding engine, the steel cable passing around a 13' double drum at the top, which, in addition to lowering the loaded and raising the empty cars, runs a small air-compressor that generates power, while serving as an auxiliary brake.

The company operates general stores at Morenci and Clifton, and owns a number of dwellings, for employees. Petroleum has been substituted for coal, wherever possible, about the mine and works.

The concentrator, on the San Francisco river, 8 miles from the mine, is of steel, in two connected sections, the 64x95' upper section having a 9x15' Blake crusher at the ore-bin, Huntington mills and a 220' Robins belt conveyor, trommels and jigs. The 57x144' lower section has 33 Frue vanners, 1 Wilfley and 2 Standard tables. The 32x50' steel power-house has two 250-h. p. Stirling water-tube boilers, and a 300-h. p. Nordberg tandem compound engine. Water is taken from wells near the river by a 600-gallon electric triplex pump. The concentrator treats about 400 tons of ore daily, this averaging 3.5% to 5.5% copper, and puts about 5 into 1, effecting a saving of about 75% of contained values. Formerly there was much trouble from the acid waters eating the iron screens, while brass or copper screens in the jigs were worn out too rapidly, by abrasion. This trouble has been overcome by a simple but highly ingenious application of the principle of electrolysis. A low-voltage electric current has been applied to the jigs, by which the screen becomes a cathode in the circuit. This attracts hydrogen from the water, which in turn attacks the metallic salts, and the copper freed is deposited on that portion of the screens formerly eaten away. Formerly, iron screens lasted only two to three days, and brass or copper screens had a life of but 30 days at most. The credit for this device is due to Mr. Bennie.

The smelter, at Clifton, 7 miles from the mines, is designed for five furnaces, and has two 350-ton water-jacket blast-furnaces, 42x170' each at the tuyeres. Above the charging floor are 23 ore-bins, each 20x20x16', with chutes. A 10' dust-flue leads to a 20x20x100' dust-chamber, with hopper-bottom, discharging periodically into cars on a railroad track, in the tunnel beneath. The fumes pass from this dust-chamber through a 170' flue to a 150' steel smokestack. A 60x80' power-house, of steel, on stone foundations, houses a 300-h. p. tandem compound condensing engine, direct-connected to blowers with capacity of 3,000 cubic feet of free air per minute. The smelter has a slag-line, with electric locomotive. A newly added converter plant, with two stands and a 250-h. p. Nordberg air-compressor, was started up March, 1906, and is said to be saving the company about $\frac{1}{2}$ cent per pound, on the output of fine copper. The blister copper produced is sold to the American Metal Co., Ltd., under a 3-year contract, expiring May 14, 1908. The briquetting plant for flue-dust and fines has a daily capacity of 60 tons, and a sampling mill is being built, in 1906. Slag losses are said to be only 0.515%, and not 1.5% copper, as reported.

Production, 1904, was 11,899,920 lbs. fine copper, and for the calendar year 1905, was 11,027,453 lbs. fine copper. In the fiscal year 1905, production was 11,295,568 lbs. fine copper, 17,127 oz. fine silver and 592 oz. fine

gold. Ore production, for fiscal year 1905, was 188,856 tons, of which the smelting ore averaged 5.15% copper, furnishing 28% of the total production, while the milling ore averaged 3.66% copper. The percentage of copper secured apparently is declining. Cost of copper, for fiscal year 1905, was 12.11 cents per pound, an increase of about one cent, and profits were \$271,150. Underground mining conditions are said to be improving. The complaints about the smelter, several years ago, were an injustice to its designer, Mr. Paul O. Wels, as the trouble was with the mine, as has been proven by the outcome. There has been entirely too much market manipulation of Shannon stock, in the past, and it is to be hoped that this is nearly at an end. The property is well equipped, and, though low in grade, should be able to earn fair profits.

SHASTA COPPER MINING CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Shasta, Cal.

SHASTA GOLD & COPPER CO.

CALIFORNIA.

Office: 326 Post St., San Francisco, Cal. W. F. Mitchell, president and general manager; W. E. von Johannsen, secretary. Capitalization \$500,000, shares \$1 par. Lands, 14 claims, in the Dog Creek district, about 12 miles north of Redding, Shasta county, California, claimed to show 3 gold-bearing quartz veins and 2 copper veins. Company is regarded with much suspicion, owing to its connection with "Baron" von Johannsen, who is an unmitigated scoundrel.

SHASTA MAY BLOSSOM COPPER CO., CONSOLIDATED.

CALIFORNIA.

Office: 36 Nevada Blk., San Francisco, Cal. Mine office: Winthrop, Shasta Co., Cal. Morton Lindley, president; Lucius A. Booth, vice-president; S. Peter, secretary and treasurer; Sumner S. Smith, superintendent. Organized 1903, under laws of Arizona, with capitalization \$10,000,000, shares \$1 par, as a reconstruction of the Shasta May Blossom Mining & Smelting Co.

Lands, 18 claims, area 300 acres, in the Pittsburg or Copper City district, circa 27 miles northeast of Redding, lands being only 800' from the holdings of the Bully Hill mine. Property shows 5 or more contact veins, having granite-porphry footwalls and slate hangings, with good gossan outcrops. Of the 3 veins more or less developed, the Middle vein ranges 5' to 40' in width, and is traceable for 9,000', carrying chalcocite, bornite and chalcopyrite, opened by tunnels of 200', 350' and 450', with a total of circa 1,500' of workings. Equipment includes an air-compressor, 20x90' machine shop and two other mine buildings. Property is 16 miles from Terry, the nearest railroad point.

SHASTA MAY BLOSSOM MINING & SMELTING CO.

CALIFORNIA.

Reorganized, 1903, as Shasta May Blossom Copper Co., Consolidated.

SHATTUCK-ARIZONA COPPER CO.

ARIZONA.

Office: Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Employ 100 men. Thos. Bardon, president; Archibald Mark Chisholm, secretary and treasurer; A. Guthrie, vice-president; preceding officers, Martin Pattison and Lemuel C. Shattuck, directors; Byron Pattison, superintendent. Organized April, 1904, under laws of Minnesota, with capitalization \$3,500,000, shares

\$10 par; issued, \$2,500,000. Annual meeting, third Saturday in February.

Lands, 6 claims, area 120 acres, patented and fully paid for, in the Warren district, lying in the northeast portion of the Bisbee camp, about one mile from the older workings of the Copper Queen, and north of the Calumet & Arizona. Country rock is Carboniferous limestone, with intrusive porphyry dikes, showing a silicious iron capping of 30' to 50' width, on a big fault. Owing to the rugged topography of the lands, tunneling is impracticable, neighboring properties holding all available tunnel-sites, hence development is by a shaft of 800', with circa 3,000' of underground workings. The shaft has been cut down to 3 compartments, 4'6"x15' in size, and the mine is to be connected underground with the Cuprite shaft of the Copper Queen. Ore occurs in irregular deposits, as in the other mines of the district, ores including all the common oxides, carbonates and sulphides, and carrying an average of 9% copper.

Development was begun by the present company August, 1904, and has been continued with great vigor. Equipment includes a 400-h. p. steam plant, with 6x10" and 16x30" hoists, good for 1,000' depth, and the mine is to have a new Allis-Chalmers duplex double-drum hoist, working under 125 pounds steam pressure, capable of handling continuously a total unbalanced load of 15,000 lbs., at a vertical hoisting speed of 2,000' per minute. The hoist will have two 7' drums, each carrying 1,500' of 1½" round steel cable. Equipment includes a Sullivan 6-drill straight-line air-compressor and 9 Ingersoll-Sergeant power drills, and a 25-drill air-compressor and 500-light electric plant are to be added. Buildings include a 16x24' carpenter shop, 15x30' smithy, boiler-house, engine-house, office, warehouse, etc. The El Paso & Southwestern railroad reaches within 3,000' of the shaft, and the company plans building a 1,000-ton aerial tramway, to be in operation before close of 1906. The tramway will have an average grade of 18%, leading to a 200-ton ore bin, now building, and probably will have a retarding engine. Fuel is petroleum, with a yearly consumption of 2,500 barrels. The company plans continuing development, and blocking out ore on the 700' and 800' levels. From about 1,000 tons of oxide and carbonate ores smelted, during the first half of 1906, average returns were 9% copper, ores having been shipped without assortment. The management plans beginning production on a considerable scale, before the end of 1906, by shipments to the Copper Queen smelter, and may build a smelter later, which probably will be located at Douglas, if built. Company estimates the probable production of 1906 at 4,000,000 lbs. fine copper, but very likely will fall somewhat short, owing to delay in beginning production, but should be a considerable producer in 1907. The Shattuck has been well handled, and very quickly developed, and bids fair to make an exceptionally fine mine.

SHAW-GIBSON MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Lordsburg, N. M.
SHAWMUT CONSOLIDATED COPPER CO.

COLORADO & UTAH.

Office: 62-16 State St., Boston Mass. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Salida, Chaffee Co., Colo. Lester C. Wead, presi-

dent; Wm. Rotch, vice-president; Robt. A. Jackson, secretary and treasurer; Herbert Williams, managing director; preceding officers, Alex. Chandler, B. W. Currier, Col. E. J. Mayo, Hon. Saml. S. Powers and John R. Thayer, directors; Elmer Durfee, superintendent Utah mine; E. Philbrick, superintendent Colorado mine. Organized 1905, under laws of Maine, with capitalization \$2,500,000, shares \$25 par; issued, \$1,225,000. American Loan & Trust Co., Boston, registrar; State Street Trust Co., Boston, transfer agent. Has an option on 65,000 shares of the Sedalia Copper Co., held in escrow until May, 1909, at \$2 per share. The Shawmut pays 15% royalty on extraction from the Salida property, such royalty to apply pro rata on the purchase price of the stock in escrow, if same is taken.

The Utah lands include 13 fractional claims, patented, area 152 acres, on the north side of Carr Fork, almost in the center of the Bingham, or West Mountain district, showing country rocks of limestone, porphyry and quartzite, carrying sundry contact veins, between limestone and quartzite, of which two, under development, are of 5' estimated average width, carrying sulphide ores, mainly argentiferous and auriferous chalcopyrite and galena, containing estimated average values of 5% copper, 26% lead, 2 oz. to 16 oz. silver and \$2.50 to \$5 gold per ton. Development is by a 230' shaft and 8 tunnels, with upwards of 7,000' of workings. Property was idle for some years, on account of litigation and poor management. On the Cuba claim, 2 upper levels have been developed, and a lower tunnel is driving, a vein of 5' average width outcropping for the length of this claim. The management hopes to secure copper-bearing porphyry, similar to that of adjoining properties, on the Mirror claim. Equipment includes a 200-h. p. steam plant, at the mine, including a 6-drill Rand air-compressor, with necessary mine buildings.

The concentrator at the Bingham property is of 100 tons daily capacity, built of wood, and equipped with a 100-ton Gates centrifugal crusher. 2 sets of rolls, 5 Hartz jigs, a Chilean mill and Wilfley tables. The mill is somewhat antiquated, and requires remodeling. The property is served by the Denver & Rio Grande railroad.

The Salida property, known as the Sedalia mine, includes 20 acres and a millsite, the mine and mill being connected by a tramway of circa 1½ miles length. The mine has a very large body of very low-grade ore, and produces 750 to 1,200 tons per month. The mill is a four-story 76x119' concentrator and leaching plant. The management of the Shawmut company states that recent improvements have reduced operating expenses so that a good profit is being made on 3% copper ore. The management of the company was changed, June, 1906. Properties are considered promising.

SHAWMUT MINING CO.

UTAH.

Succeeded, 1905, by Shawmut Consolidated Copper Co.

SHAWNEE COPPER MINING CO.

WYOMING.

Office: 122½ East Main St., Shawnee, Okla. Mine office: Encampment, Carbon Co., Wyo. Employs 10 men. J. H. Ware, president; B. F. Hamilton, vice-president; A. M. Coffin, secretary; John H. Aydelotte, treasurer.

urer; preceding officers and Frank E. Fagerquist, directors; A. H. Crow, superintendent. Organized September 20, 1905, under laws of Oklahoma, with capitalization \$1,000,000, shares, \$1 par; issued, \$630,000. Annual meeting, first Thursday in October.

Lands, 10 claims, area 200 acres, well timbered, lying in the French district, on Iron Creek, near the New Rambler mine, showing sundry fissure veins in granite, and contact veins between schist and quartzite, of which one vein, of bog ore, under development by a 115' two-compartment shaft, is showing copper stains only. Equipment includes a 45-h. p. steam plant, and four buildings, of logs.

SHEEP MOUNTAIN MINING & TUNNEL CO.

COLORADO.

Letters returned unclaimed from former mine office, Crystal, Colo.

SHELDEN & COLUMBIAN MINE.

MICHIGAN.

Office and mine: care of J. H. Rice, Houghton, Houghton Co., Mich. Lands lie next north of the Isle Royale Copper Co. Idle since 1870. Fully described in Vols. I and II.

SHOSHONE MINE.

NEW MEXICO.

Office and mine: care of Alex Gusdorf, owner, Taos, Taos Co., N. M. Lands, 4 claims, developed by a 175' shaft, with several hundred feet of drifts on the 100' and 150' levels, showing an 8' vein with a 2' paystreak, latter carrying 5% copper, 10 oz. to 12 oz. silver and 3 oz. to 4 oz. gold per ton, balance of vein averaging 5% to 8% copper, 4 oz. to 5 oz. silver and \$10 to \$12 gold per ton. Property is considered promising.

SHOSHONE MOUNTAIN MINING CO.

WYOMING.

Mine office: Meeteetse, Big Horn Co., Wyo. P. W. Gates, manager. Lands, sundry claims, on Sparr Mountain, showing a wide vein, carrying values mainly in silver-lead, opened by a 560' tunnel, on the Smuggler claim.

SHOTWELL TRI-MOUNTAIN COPPER CO.

ARIZONA.

Office: 323 Security Bldg., St. Louis, Mo. Mine office: Ajo, Pima Co., Ariz. Organized under laws of Arizona, and is supposed to own the Shotwell mine, a rather promising property, slightly developed, but circa 68 miles from rail connections.

SHRIVER MINE.

TEXAS.

An old mine, with a 385' shaft, idle some years, near Llano, Llano county, Texas.

SHUTTLETON MINE.

AUSTRALIA.

Mine office: Shuttleton, N. S. W., Australia. Property, in the Crowl Creek district, is opened to a depth of 330', the bottom level showing a 12' vein, with 4' paystreak of chalcopryite, assaying 22% copper. Presumably idle.

SIEGEL CONSOLIDATED MINING CO.

NEVADA.

Mine office: Siegelton, White Pine Co., Nev. Presumably successor to the Vulcan Consolidated Co., of which Henry Siegel, the New York department-store merchant, was president, and which went out of business quietly, without paying its debts. Lands, 49 claims, area 980 acres, also 3 millsites, in the Sodaville or Santa Fé district, developed, 1903, by circa

7,000' of underground openings, claimed to show circa 60,000 tons of ore, assaying 2.7% to 4% copper, with 75 cents to \$1 gold and silver per ton. Property has a small and inadequate smelter.

SIERRA-ALTO COPPER MINING CO.

ARIZONA.

Letter returned unclaimed from former office, 60 State St., Boston, Mass.

MINAS DE SIERRACILLA DEL TAMUJOSO.

SPAIN.

Office: care of Wm. Guthrie Bowie, manager, Alosno, Huelva, Spain. Mine office: Puebla de Guzmán, Huelva, Spain. C. & J. Sundheim, owners. Some shipments were made by former operators, but ore is complex and requires special treatment. Idle for several years

SIERRA COMPANY, LTD.

SPAIN.

Offices: 32, Nicholas Lane, London, E. C., Eng. Mine office: 10, Plaza del General Santacildes, Burgos, Burgos, Spain. T. Evens, secretary. Organized April 2, 1898, with capitalization £400,000, shares £10 par; debentures, £478,100, at 5%. Lands, sundry mines, carrying iron, copper, silver and coal, in the provinces of Burgos and Logroño, Spain.

SIERRA DE COBRE MINE.

MEXICO.

Described under title Indiana-Sonora Copper & Mining Co.

SIERRA DE ORO GOLD MINING & MILLING CO.

ARIZONA.

Office and mine: Clifton, Graham Co., Ariz. F. T. Eldredge, president; W. H. Waite, secretary and treasurer; L. P. Potter, manager; Benj. M. Crawford, superintendent. Lands, 15 claims, near the Clifton Consolidated, also a 5-acre millsite, on the San Francisco river. Development is by tunnels, showing 4 parallel blind veins. A 550' crosscut tunnel shows a 10' vein, giving assay values of 14% copper and up to \$10 gold per ton, and a 4' vein giving assays of 14% copper and \$48 gold per ton. Property is well regarded.

SIERRA MADRE EXPLORATION, LTD.

MEXICO.

Offices: 708, Salisbury House, London, E. C., Eng. J. K. Pollock, chairman; J. W. Gallienne, secretary. Organized Nov. 21, 1900, with capitalization £60,000, shares 5s. par; issued, £40,000. Debentures, £1,000 authorized, £900 outstanding. Had options on gold and silver properties in the state of Chihuahua, Mexico, which were forfeited. Present landed holdings are 200 pertenencias, area 494 acres, in the state of Sonora, supposedly carrying auriferous and argentiferous copper ores.

SIERRA MORENA COPPER MINES, LTD.

SPAIN.

Offices: 2, Basinghall Ave., London, E. C., Eng. Letter returned unclaimed from former mine office, Peñaflor, Sevilla, Spain. R. Stanton, mine manager; J. E. G. Hadath, secretary. Organized April 17, 1900, with capitalization £80,000, shares £1 par; issued, £60,007. Lands were 12 hectares, including La Preciosa and adjoining mines.

MINAS DE SIERRA NEVADA.

SPAIN.

Mine office: Guejar Sierra, Granada, Spain. Supposedly owned by a Belgian company. Have argentiferous copper ores. Idle.

SIERRA PACIFIC SMELTING CO.

MONTANA & MEXICO.

Disappeared, 1906, from former offices, in Minneapolis.

SIERRA-SONORA SMELTING CO.**MEXICO.**

Title changed, 1903, to Sierra-Pacific Smelting Co.

SIERRITA MINING & MILLING CO.**ARIZONA.**

Office: care of J. P. Owen, general manager, Tucson, Ariz.

SIGNAL COPPER CO.**ARIZONA.**

Office: care of Col. H. G. Heffron, president, Kingman, Ariz. Lands, sundry claims, including the Copper Prince group, on the Bill Williams Fork river, near the line of the Arizona & California railroad, in Yuma county, Arizona. The Copper Prince has a 150' shaft, showing a very large body of copper ore. Ample water is available, from the river. Property is said to have been sold, March, 1906, to O. P. Posey, and others. Property is regarded as promising.

SIGNET GOLD & COPPER MINING CO.**UTAH.**

Office: care of E. E. George, secretary, Salt Lake City, Utah. Letter returned unclaimed from former mine office, American Fork, Utah Co., Utah. C. E. Stewart, president; A. W. Lister, treasurer; Organized November, 1903, under laws of Utah, with capitalization \$75,000, shares 25c. par. Property is the Signet group, 4 claims, on which a little work has been done. Idle.

SILERS MEADOWS COPPER CO.**NORTH CAROLINA.**

Mine office: Bushnell, Swain Co., N. C. Lands, circa 1,900 acres, in the Smoky Mountains, on the Tennessee copper belt. Has 11 shafts and tunnels, all showing ore, said to give average assays of 5.5% copper and \$1.80 silver and gold per ton. Property regarded as promising, but presumably idle.

SILVER BAR COPPER MINING CO.**NEW MEXICO.**

Dead. Property sold, circa 1902, to Mogollon Gold & Copper Co.

SILVER BELL COPPER CO.**ARIZONA.**

Title changed, 1903, to Imperial Copper Co.

SILVER BOW MINE.**MONTANA.**

Owned by Butte & Boston Consolidated Mining Co.

SILVER CITY REDUCTION WORKS.**NEW MEXICO.**

Owned by Comanche Mining & Smelting Co.

SILVER CLIFF GOLD & COPPER MINING CO.**MONTANA.**

Letters returned unclaimed from former mine office, Saltese, Missoula Co., Montana, and various other points.

SILVER CLIFF MINING CO.**IDAHO.**

Mine office: Lookout, Nez Perce Co., Idaho. Jas. D. Young, manager. Ore body carries an 18" paystreak, giving assay values up to 70% copper and \$200 gold per ton.

SILVER CONNOR MINE.**NEVADA.**

Mine office: Eureka, Eureka Co., Nev. Said to have blocked out circa 50,000 tons of low-grade ore, averaging about \$6 in gold and silver, and shipped a little high-grade ore, averaging 27.9% copper, to a Salt Lake smelter, in 1903.

SILVER CREEK GOLD MINING CO.**WASHINGTON.**

Office: Everett, Wash. Letter returned unclaimed from former office, Index, Snohomish Co., Wash. A. J. Westland, president; W. B. E. Edwards, secretary. Capitalization \$1,000,000, shares \$1 par. Lands, 6 claims, circa 10 miles from Index, opened by about 500' of tunnels, said to show a vein of fair size, carrying small copper values and fair gold and silver values.

SILVER FLAT MINING & MILLING CO.**UTAH.**

Office: care of Abel John Evans, Lehi, Utah. Mine office: American Fork, Utah Co., Utah. Capitalization \$50,000, shares 10 cents par. Lands, 5 claims, in the Silver Lake district, carrying auriferous and argentiferous copper and lead ores.

SILVER GLANCE GROUP.**NEW MEXICO.**

Office and mine: care of Joseph Oliver, owner, Chloride, Sierra Co., N. M. Lands, 6 claims, area 120 acres, also a millsite, in the Apache district, showing 7 fissure veins, averaging 4' width, opened by shafts of 60', 100', and 110' and tunnels of 120' and 125', showing sulphide ores, giving assays of 10% copper, 30 oz. silver and \$10 gold per ton.

SILVER HILL MINING CO.**NORTH CAROLINA.**

Mine office: Silver Hill, Davidson Co., N. C. J. M. Prim, superintendent, at last accounts. Ores carry gold, silver, lead, copper and zinc. Has steam power and a mill with 5 stamps, crusher and rolls.

SILVER KING MINING CO.**UTAH.**

Mine office: Park City, Summit Co., Utah. Hon. Thos. Kearns, general manager; W. J. Dalley, superintendent. Ores carry gold, silver, lead and copper. Has steam power and a 250-ton concentrator, employing circa 300 men. Is a famous silver mine, and secures a little copper as a by-product.

SILVER LAKE MINES.**COLORADO.**

Owned by Guggenheim Exploration Co.

SILVERMAN-ALASKA MINING CO.**ALASKA.**

Office: 11 Broadway, New York. Mine office: Ketchikan, Alaska. Supposedly organized under laws of New Jersey. Lands, on Prince of Wales Island, are said to show auriferous copper ores, of good grade, with considerable development.

SILVER MONUMENT MINE.**NEW MEXICO.**

Mine office: Chloride, Sierra Co., N. M. B. S. Phillips, superintendent, at last accounts. Ores carry silver, gold and copper. Has steam power and a 5-stamp mill.

SILVER MOUNTAIN MINING CO.**COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. Ores carry gold, silver and copper. Has steam power and a small stamp-mill.

SILVER SHIELD MINING CO.**UTAH.**

Office: care of H. S. Joseph, manager, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs circa 20 men. Lands, sundry claims, showing a 4' vein, giving assays of 8% to 10% copper, 15 oz. to 100 oz. silver and \$9 to \$15 gold per ton, from selected ores. The

mine also shows a little silver-lead ore, of good grade, and has a considerable body of low-grade milling ore. Mine has made some concentrates, at the Kempton mill, and management is said to have secured land, from the Boston Consolidated, near the mouth of the Silver Shield tunnel, for a millsite, and to plan building a 60-ton concentrator thereon. Company proposed consolidating with the United Bingham, March, 1906, but the consolidation was not effected.

SILVERSMITH MINE.**MONTANA.**

Letter returned unclaimed from former mine office, Basin, Mont.

SILVER SPUR MINING CO.**AUSTRALIA.**

Office and mine: Silver Spur, Stanthorpe Co., Queensland, Australia. Employs circa 100 men. Robert T. Vyner, chairman; Edgar Hall, secretary, treasurer and general manager; Henry Wann, mining captain. Organized 1898, under laws of Queensland, with capitalization £24,000, shares £1 par, 15s. paid in. Has paid dividends of £18,300.

Lands, 49 acres, leasehold from the crown, showing 4 lenses, averaging 8' in width and 100' in length, with varying depths, carrying sulphide ores, returning 1% copper, 12% lead, 20% zinc, 25 oz. silver and \$1 gold per ton. Has shafts of 100', 180' and 300', with about 12,000 tons of ore blocked out for stoping. Has a steam plant, including hoist, 5-drill air-compressor, crusher, Chilean mill and a sawmill.

The smelter, which receives ore by tram-line, has two 42x100" Austin water-jacket pyritic blast-furnaces, of 60 tons daily capacity each, and 2 reverberatory furnaces, daily capacity 15 tons each. Product is turned out as 33% matte, carrying 900 oz. to 1,000 oz. silver per ton, sent to Europe for refining. Production, 1903, was 71,680 lbs. fine copper, and 1904 was 98,560 lbs. fine copper.

SILVER TIP GOLD MINING CO.**WASHINGTON.**

Office: Tacoma, Wash. Letter returned unclaimed from former mine office, Maple Falls, Whatcom Co., Wash. Ores carry gold, silver and copper.

SILVERTON MINING CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. J. H. Starkweather, superintendent, at last accounts. Lands, on Sultan Mountain, include the North Star mine, producing ores of gold, silver and copper. Has steam and water power and a 60-stamp mill.

SILVERTON MINING CO.**WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Was developing a vein, carrying ores of gold, silver and copper, near the Bonanza Queen mine, at last accounts. Presumably idle.

SILVER WING MINE.**COLORADO.**

Mine office: Animas Forks, San Juan Co., Colo. Has a 25-ton leaching plant, completed late in 1905, using the Waterbury process. Ores are roasted, before leaching with sulphuric acid made from the roast fumes. Management is said to plan enlarging the plant to a permanent 200-ton mill if the process proves successful.

SIMILKAMEEN COPPER MINES.**BRITISH COLUMBIA.**

Stuart Armour, president, at last accounts. Capitalization \$200,000, shares 10c. par. Lands, supposedly somewhere in the Similkameen district of British Columbia. Presumably moribund, or dead.

SIMILKAMEEN MINING & SMELTING CO., LTD.**BRITISH COLUMBIA.**

Office: care of Chas. F. Law, secretary, Vancouver, B. C. Fred Buscombe, chairman; W. H. Armstrong, managing director; preceding officers, E. J. McFealey and Clarence Marpole, directors. Organized 1905, under laws of British Columbia, with capitalization \$2,000,000, shares \$10 par.

Lands, 5 claims, 3 crown-granted, area circa 200 acres, known as the St. Lawrence and St. George groups, 8 miles from Tulameen City, on Bear Creek, a tributary of the Tulameen river, in the Similkameen division of the Boundry district of British Columbia. Lands are well timbered and have a 250-h. p. available waterfall, on Bear Creek. Development is by 4 shallow shafts, of circa 50' depth each, a short tunnel, and numerous trenches and open-cuts. The property shows a strong ore body, between schist and granite, with intrusive porphyry dikes. The St. Lawrence mine has two 50' shafts, showing an 8' vein of massive cupriferous iron sulphides, giving average assays of about \$10 per ton in copper, silver and gold. The St. George group shows a 4' vein, carrying ore with quartz gangue, giving average assays of 1.38% copper, 2.08 oz. silver and \$53 gold per ton. Property is considered promising.

SIMSBURY MINE.**CONNECTICUT.**

A small, old and idle mine, at Granby, Hartford county, Connecticut.

SINAI MINING SYNDICATE.**ARABIA.**

Mine office: Mt. Samarah, Arabia, care of G. Beyts & Co., Suez, Egypt. M. Wanner, mine manager. Property is sundry old copper mines, worked by the early dynasties of Egyptian kings, and abandoned probably some 1,500 years before the Rio Tinto was first opened by the Phoenicians, which latter event occurred circa 1100 B. C.. A little work was done, in 1903. Presumably idle.

SINALOA EXPLORATION CO.**MEXICO.**

Office: Commonwealth Trust Bldg., St. Louis, Mo. Geo. B. Clark, president; Dr. H. H. Born, secretary; Chas. Wiggins, treasurer; preceding officers, Chas. H. Filley, John Hartman, Henry Leschen, Chas. M. Rhodes and W. S. S. Rodgers, directors. Capitalization \$500,000, shares \$1 par. Lands, sundry claims, also 7 square miles of miscellaneous timber and mineral lands, circa 80 miles northeast of Mazatlán, in the state of Sinaloa, Mexico. Property included the Santa Eduwiges and La Luz mines, which have been disposed of, for stock interests, to the Metates Mining Co., and one other new corporation.

SINALOA & SONORA MINING & SMELTING CO.**MEXICO.**

Office: 1133 Broadway, New York.

SINBAD MINE.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Lands lie just north of the Pittsburg & Montana, in East Butte, and are opened by a shaft of circa 600' depth.

SISKIYOU COPPER MINING CO.**CALIFORNIA.**

Office: care of G. W. Holmes, Chatham, Ont. Mine office: Ashland, Jackson Co., Ore. Employs 12 men. Dr. J. F. Reddy, manager. Lands, sundry claims, in vicinity of the Blue Ledge mine, upper Applegate district, Siskiyou county, California, including the Cook & Green claims, adjoining the Blue Ledge mines, near the Oregon line, developed by a 250' tunnel, said to give a promising showing of ore.

SISKIYOU GOLD & COPPER CO.**CALIFORNIA.**

Office: 326 Post St., San Francisco, Cal. Mine office: Rollins, Siskiyou Co., Cal. Lands, said to be 8 claims, area 160 acres, on the state road between Yreka and Rollins, Siskiyou county. Regarded with deep suspicion, because stock was peddled by the notorious "Baron" W. E. von Johannsen, of the Pacific States Mining & Investment Co.

SISKIYOU GOLD & COPPER MINING CO.

Letter returned unclaimed from former office. Salt Lake City, Utah.

SISKOWIT MINE.**MICHIGAN.**

Located near Rock Harbor, Isle Royale, Michigan. Has a 5' amygdaloid vein, carrying sheet copper, in contact with walls, opened by a 500' main shaft. Worked 1845-1855, making circa 150 tons fine copper, and since idle.

MINA LA SIVERIA.**MEXICO.**

Office and mine: care of E. Torres, owner, Topia, Durango, Mexico.

SIX EAGLES MINING CO.**WASHINGTON.**

Office: Olympia, Wash. Mine office: Loomis, Okanogan Co., Wash. Robt. Frost, superintendent, at last accounts. Has auriferous and argentiferous lead and copper ores, with steam power.

SJANGELI MINES.**NORWAY & SWEDEN.**

Mine office: Sjangeli, Norway. Lands, circa 30 miles from the coast, with good water power available, include the Sjangeli, Mina Alakats, Valfojokk and Ruopsuokjaure groups, partly in Norway and partly in Sweden. Country rocks are hornblende schists, with narrow strata of limestone and lenticular bodies of massive gabbro, ores occurring in the schists as cuprite, chalcocite, bornite and chalcopyrite, assaying 2.5% to 55% copper, with an average tenor of about 12.5%. Property, though but slightly developed, is considered decidedly promising.

SKOVVASFJELDETS AKTIEBOLAG.**NORWAY.**

Mine office: Haran, Norway. N. Tiskum, manager, at last accounts.

SKYLARK COPPER MINING & MILLING CO.**UTAH.**

Office: 40 Commercial Blk., Salt Lake City, Utah. Letter returned unclaimed from former mine office, Blue Acre, Beaver Co., Utah. A. J. McMullen, president and general manager; E. A. Cook, secretary and treasurer. Organized May, 1899, under laws of Utah, with capitalization \$75,000, shares 25c. par. Is under same management as O. K. Extension Mining & Reduction Co. Lands, 10 claims, area 200 acres, in the Beaver Lake district, showing a 4' contact vein between limestone and granite, opened by shafts of 150' and 365' and by 6 tunnels, longest 155', showing chalcopyrite

and galena, former estimated by company to average 5% copper and 6 oz. silver, and latter 40% lead, 76 oz. silver and \$2.50 gold per ton. Has gasoline power. Property regarded as promising.

SLATE CREEK MINING CO.

ARIZONA.

Letters returned unclaimed from former office, Cleveland, Ohio, and former mine office, Prescott, Yavapai Co., Ariz.

SLATE CREEK MINING & MILLING CO.

WYOMING.

Mine office: Wheatland, Laramie Co., Wyo. M. F. Montgomery, superintendent, at last accounts.

SLATER COPPER MINES CO.

MISSOURI.

Office: Willow Springs, Mo. Lands are in Shannon county, Missouri, Idle since circa 1901.

SLEEMINABAD COPPER CO.

INDIA.

Office: care of P. C. Dutt, manager, Residency Road, Jubbulpore, Central Provinces, India. Lands are sundry claims, $1\frac{1}{2}$ miles from the station of Sleeminabad, on the East Indian Railroad, 40 miles from Jubbulpore, and 650 miles from Bombay, almost in the centre of India. The formation is of Silurian age, country rocks being dolomite, slate, quartzite, mica-schist and jasper, much crumpled and metamorphosed, with numerous porphyry dikes, ore occurring in the vicinity of the porphyry. The Dharwar schists, here seen, belong to the same geological horizon as the Kolar gold fields. Country rocks have a generally east and west strike, and southern dip, with veins occurring at approximately right angles and having a westerly dip. The veins have well defined walls, with considerable fluccan, showing slickensides. The property shows 16 veins, in a radius of 10 miles, veins averaging 6' width, one vein outcropping for nearly 2 miles. Development is by a 100' vertical shaft, and considerable diamond drilling has been done, showing auriferous and argentiferous malachite and tetrahedrite, giving assay values, according to the Indian Government Survey, up to 25% copper, 197 oz. silver and 15 dwts. gold per long ton. Ore produced has been sold for £7 5s. 6d. per ton. Property is considered worthy of careful investigation.

SLIDE ROCK CLAIMS.

MEXICO.

Office: care of Alpheus McCallum, 162 Randolph St., Chicago, Ill. Mine office: Magdalena, Socorro Co., N. M. Lands, 6 claims, area 120 acres, in the Magdalena district, 2 miles from the Santa Fé railway, held under bond and lease by Alpheus McCallum, Dr. Alex. McCallum and Dr. W. W. McCallum. Property is developed by tunnels of 120' and 200', showing ore assaying 21.2% copper, 6 oz. silver and \$19.84 gold per ton, with occasional lead and zinc values.

SMELTING & REFINING COMPANY

AUSTRALIA.

OF AUSTRALIA (1901), LTD.

In voluntary liquidation, December, 1905, and practically succeeded by Australian Smelting Corporation, Ltd.

SMOKEHOUSE MINING CO.

MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Bernard Noon, general manager, at last accounts. Has a 500' two-compartment shaft. Idle

SMUGGLER GOLD & MINING CO.**WASHINGTON.**

Office: 202½ Stark St., Portland, Ore. Mine office: Index, Snohomish Co., Wash. Employs 4 men. McKinley Mitchell, president; Samuel Hart, secretary; D. S. Williams, treasurer; W. J. Walters, general manager. Organized July, 1904, under laws of Washington, with capitalization \$1,000,000, shares \$1 par: issued, \$600,000. Lands, 19 claims, in the Silver Creek district.

SNOHOMISH & TRAMWAY MINES.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. John S. Harris, receiver. Courts have decided that the Butte & Boston Consolidated Mining Co. owns two-thirds of the Tramway and one-half of the Snohomish, balance going to the Butte Coalition Mining Co.

SNOWBIRD MINE.**MONTANA.**

A property at Butte, Silver Bow county, Montana, formerly in dispute between the Montana Ore Purchasing Co. and the Anaconda Copper Co. Title now rests between the Anaconda and Butte Coalition companies.

SNOWSHOE COPPER MINING CO.**MONTANA.**

Supposedly has copper claims, somewhere in Montana. Diaphanous.

SNOWSHOE GOLD & COPPER MINES, LTD.**BRITISH COLUMBIA.**

Offices: 7, Poultry, London, E. C., Eng. Mine office: Phoenix, B. C. Earl of Chesterfield, chairman; Geo. S. Waterlow, D. L., J. P., vice-chairman; H. W. Batty, secretary; Anthony J. McMillan, managing director; J. W. Astley superintendent; J. H. Trevor, mining captain. Organized Jan. 20, 1901, under laws of United Kingdom, with capitalization £250,000, shares £1 par; issued, £198,855. Lands, 4 claims, area 120 acres, freehold, about ¼ mile from the Granby, in the Grand Forks or Boundary division of the Yale district. Ore occurs, exclusively as chalcopyrite, in fissure replacements, ranging 25' to 200' in width, with an average of about 100', by 1,000' length. Ore occurs occasionally in distinct bodies, somewhat mixed, but is mainly disseminated in minute particles throughout a gangue varying from silicious to calcareous, and carrying occasional magnetite and specular hematite. Experiments in electrolytic reduction, conducted on this ore by Thos. A. Edison, did not result successfully. The mine has tunnels of 200', 250' and 600', with shafts of 200' and 300', the main shaft having 3 compartments, with a 150-h. p. double-drum electric hoist, raising 2-ton skips, but bulk of production is secured from open-cast workings.

Machinery plant includes a 30-drill Rand Corliss cross-compound condensing steam and compound air-compressor. Production was 20,000 tons of ore in 1902, and 74,000 tons in 1903, mined at an average cost of \$1.10 per ton. Ore was shipped to smelters at Greenwood and Boundary Falls for reduction, the mine having direct rail connection with the Canadian Pacific line. A merger of the Snowshoe with the British Columbia Copper Co. was under consideration for some time, but was not effected. The ore body is low in grade, but of great size, and worked upon the scale of other big ore bodies of the same district, with equal capital and skill, the Snowshoe should make a successful mine.

SNOWSTORM GOLD & SILVER MINING & MILLING CO. COLORADO.

Mine office: Durango, La Plata Co., Colo. J. E. Downer, manager, at last accounts. Ores carry gold, silver, copper and mercury. Has water power and a 10-stamp mill. Presumably idle.

SNOW STORM MINING CO. IDAHO.

Office and mine: Mullan, Shoshone Co., Idaho. Employs circa 150 men. H. H. Burns, president; Thos. Donnelly, vice-president and general manager; F. J. Edwards, secretary and treasurer; J. H. Hewand & Co., lessees. Organized 1899, under laws of Idaho, with capitalization \$1,250,000, shares \$1 par.

Lands, 8 claims, 6 patented, area 160 acres, also a 2-acre millsite, in the Hunter district, showing a fissure vein of 10' to 60', with an average of circa 20' width, opened by a 200' shaft and by tunnels of 200', 600' and 1,800', with about one mile of workings, estimated by company, early in 1905, to show 500,000 tons of ore blocked out for stoping. Ores, as developed, are oxides and carbonates, with silicious gangue, being especially suited for converter linings. An average of 6 general assays, in 1905, gave 10.9% copper, 11.6 oz. silver and 50 cents gold per ton, from a 14' breast on the 1,000' level. The mine has a water power plant, and an experimental leaching plant. A 7,300' tramline leads from No. 2 tunnel to the Larson railway spur.

The upper levels of the mine are operated, under a 5-year lease, on royalty, by Messrs J. H. Hewand and Thos. L. Greenough, under the firm name of J. H. Hewand & Co. Mr. Greenough and his associates are said to own nearly 75% of the stock of the company, and have urged the levying of an 8-cent assessment, for the further equipment of the mine. The minority shareholders are bitterly opposed to this assessment, stating that Mr. Greenough and his associates, through the profits of their lease, are in a position to pay the assessment on their stock, while the minority shareholders would have to dig up the cash from their pockets. There is considerable force in this argument, but, as a matter of fact, there can be little doubt that the 8-cent assessment, if expended properly, would add at least ten times that amount to the value of the property, and careful investigation of the facts in the case does not show that the lessees have been gouging the property. The basis for the animosity displayed toward them lies, apparently, in the fact that the lessees are earning very handsome profits—which they seem entitled to, from their courage in putting their own cash into the property.

The mine has considerable development, and some excellent reserve stopes. More or less ore has been shipped since 1904, and production, for 1905, is estimated at 55,000 tons of ore, carrying 4,950,000 lbs. fine copper. Property is considered of much promise.

SOCORRO GOLD CO. ARIZONA.

Office and mine: Harrisburg, Yuma Co., Ariz. Geo. D. Workman, president; S. C. Workman, secretary; F. C. Smith, general manager. Organized 1901, under laws of Arizona, with capitalization \$500,000, shares \$1 par. Lands, 10 claims, area 200 acres, in the Ellsworth district, showing a fissure vein of 2' width, carrying covellite and chalcopyrite, assaying about \$10 gold and 5 oz. silver per ton, with small copper values, developed by a 667' shaft

and 11 tunnels, with 2,467' of underground workings, having 5,000 tons of ore blocked out for stoping. Has a 20-stamp mill, 3 Standard concentrators and cyanide plants of 10 tons and 50 tons daily capacity.

SOLACE COPPER MINING CO.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Ignatius Schlinger, president and treasurer; Henry Smith, vice-president; A. P. Murray, secretary; T. Schlinger, treasurer. Organized 1903, under laws of Arizona, with capitalization \$500,000, shares \$1 par, in \$100,000 preferred and \$400,000 common shares. Lands, 4 claims, in the Bloody Tank district, circa 8 miles from Globe, showing 4 ore bodies, of 20' average width, opened by several pits, giving assays of 8% copper and \$15 gold per ton.

MINA SOLEDAD.**MEXICO.**

Office and mine: care of Dr. S. H. Quint, Ameca, Jalisco, Mexico. Chris. O'Brien, manager. Lands, 78 pertenencias, circa 12 miles southwest of Ameca, in the Sierra Tetilla district, opened by about 1,600' of shafts and tunnels. Deepest workings 400', with sulphides below the 200' level, showing circa 10,000 tons of ore, in a 12' vein carrying copper and free gold, values being mainly gold. Equipment includes a 3-stamp Hendy mill, 1 Wilfley table and 1 Pender concentrator.

SOLMS-BRAUNSFELS'SCHE BERGWERKE.**GERMANY.**

Mine office: Braunsfels, Rheinprovinz, Germany. Herr Bergassessor Bellingier, manager. Has ores of iron, manganese and copper.

SOLOMON SPRINGS COPPER MINING CO.**ARIZONA.**

Office and mine: Naco, Cochise Co., Ariz. Lands, 20 claims, area 400 acres, in the Naco valley, about midway between Bisbee and Naco. Lands show a vein having a gossan of 4' to 40' width. Was under bond, for several years, to the Houghton Development Co.

SOMBRERETE MINING CO.**MEXICO.**

Mine office: Sombrerete, Zacatecas, Mexico. Is an extensive silver-lead property, controlled by the Compañía Metalurgica Mexicana.

SONGATOF MINE.**RUSSIA.**

A small producer, in the Russian Altai.

SONOMA MINES OF MEXICO, LTD.**MEXICO.**

Offices: 4, Great Winchester St., London, E. C., Eng. Mine office: Avino, Durango, Mex. G. H. Johnson, secretary; W. B. Jeffrey, mine manager; E. L. Wagner, superintendent. Organized Nov. 4, 1899, with capitalization £500,000, shares £1 par; issued, £450,400. Lands, 415 acres, carrying ores of gold, silver and copper, the Sonoma claims showing a large body averaging 2.5% to 4% copper, with fair gold and silver values, while the Malinche claim is said to show ore carrying up to 10% copper, with small gold and silver values. Has steam power.

SONORA BONANZA MINING CO.**MEXICO.**

Office: La Cananea, Sonora, Mex. Mine office: Imuris, Sonora, Mexico. W. M. Barker, president and general manager; Hon. Chas. Smith, vice-president; R. E. Lopez, secretary; Wm. Gmahling, treasurer; John E. Penberthy consulting engineer; Chas. Hanley, superintendent. Organized July 2,

1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par.

Lands, 135 pertenencias, with extensive holdings of miscellaneous lands, circa 25 miles south of Nogales. The mine shows a prominent outcrop, of 10' average width, traceable $1\frac{1}{2}$ miles, the gossan giving quite uniform assays of \$6 to \$7 gold per ton. The vein, of 6' to 10' average width, shows a 3' paystreak carrying galena, chalcopyrite and wulfenite, with silver values, and with occasional free gold. The molybdenum deposits are considered promising. The mine has ore-loading pockets on the 100' and 200' levels of shafts of 250' and 350' depth. The San Miguel property was idle, at last accounts, the formation being much disturbed.

Equipment includes a steam plant with 3 boilers, 2 hoists and 2 pumps, and an electric light plant and a new air-compressor are to be installed. Water is secured from a well, and a storage reservoir has been built, to hold the mine-water. The company has a general store and sundry dwellings for employes, and also has a lime-kiln, small brick-plant and a small concentrator, latter completed May, 1906. Property is considered promising.

SONORA CHIEF MINING CO.

MEXICO.

Office: 323 American Bank Bldg., Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mexico. L. H. Jansen, president and general manager; Dr. M. T. Runnels, vice-president; Dr. C. L. V. Hedrick, secretary and superintendent; Harry Haldemann, assistant secretary and treasurer; preceding officers, A. H. Glasner and W. T. Cramer, directors; Morris Hesse, mine superintendent. Organized July 18, 1904, under laws of Arizona, and protcolized, October, 1905, under laws of Mexico, with capitalization \$1,500,000, shares \$1 par; issued \$1,380,000. Statement, as of March 1, 1906, gave cash on hand, \$17,000, and cash due company \$9,000, without accrued liabilities.

Lands, 11 claims, area 464 acres, in the Ures district, with country rocks of granite-porphry, diorite and limestone, showing several large, continuous ore bodies, of which 4, under development, are of 5' to 6' average width, carrying ores giving average assays of 15.8% copper, 10 oz. to 80 oz. silver and \$25 to \$49 gold per ton. Company says that 10% of production is auriferous and argentiferous whitneyite, an arsenical ore of copper. Development is by shafts of 95' and 125', and by tunnels of 25', 754' and 248', with a total of 2,186' of underground workings. Development is mainly at the Phoenix group, the Lakeside group being held in abeyance. The Yaqui river has an available waterfall, estimated at 440 h. p. The new line of the Southern Pacific will pass within one mile of the mine. Company plans continuing development and building a modern concentrator, during 1906.

SONORA COPPER COMPANY OF MEXICO.

MEXICO.

Assets, consisting of a lawsuit, sold to Puertecito Copper Co.

SONORA DEVELOPMENT CO.

MEXICO.

Office: 603 New Ridge Bldg., Kansas City, Mo. Mine office: Moctezuma, Sonora, Mex. Wm. Huttig, president; John W. Amerman, secretary; Jas. E. Lawrence, engineer. Organized under laws of Arizona. with capitali-

zation \$1,000,000. Lands, 98 pertenencias, area 242 acres, including the Don Genaro y Anexas, Nacozari Copper Queen, Wostenholm, Conforme, Goodlander, Santa Clara, Cuahtemoc and La Verde groups. The Nacozari Copper Queen, area circa 65 acres, lies between the Nacozari and Belle Union mines of the Moctezuma Copper Co., giving ore assaying up to 58% copper. Some development has been secured, by shafts and tunnels, the mine openings being of somewhat random occurrence, showing ores carrying argentiferous and auriferous copper and lead sulphides. There is said to be a possibility of litigation over some of the properties claimed by the company, and the mining operations of the company are of a very languid nature.

SONORA & KANSAS CITY DEVELOPMENT CO.

MEXICO.

Letter returned unclaimed from former office, Kansas City, Mo. Mine office: Suaqui de Batuc, Ures, Sonora, Mexico.

SONORA MINING CO.

MEXICO.

Office: 201 Ward Blk., Battle Creek, Mich. Mine office: Aguacaliente de Baca, Sinaloa, Mexico. J. C. Barber, president; D. L. Merrill, vice-president; A. W. Davis, secretary and treasurer; preceding officers, J. W. McCrea, A. E. McBeth, H. G. Barber and H. A. Clapp, directors; E. A. Clapp, general manager; D. H. Livingston, superintendent; S. C. Whipple, engineer. Organized 1901, under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par; issued, \$1,250,000.

Lands, 149 pertenencias, area 368 acres, also 150 acres pasture lands, in the Alamos district of Sonora, with country rocks of granite-porphry and limestone, showing sundry fissure veins, carrying lenticular ore bodies, of which 4 are slightly developed by 5 shafts, deepest 105', and by about 1,700' of tunnels, the four veins have average widths of 15', 12', 10' and 3', giving assays of 6.8% to 18.7% copper, 9% to 13% lead, 17.8 oz. to 30 oz. silver, and \$1 to \$2 gold per ton, from oxide and carbonate ores, vein changing to heavy sulphides at little depth. Company plans continuing development and building a 15-ton wood-burning reverberatory furnace.

SONORA MINING & DEVELOPMENT CO.

MEXICO.

Letter returned unclaimed from former mine office, Hermosillo, Sonora, Mexico. Was said to have a property showing auriferous and argentiferous copper ore, of good grade, also a graphite mine, from which several hundred tons of plumbago are said to have been shipped.

SONORA MINING & MILLING CO.

MEXICO.

Succeeded, Feb. 15, 1906, by Juarez Mining Co.

SONORENSE PROSPECTING & DEVELOPING CO.

MEXICO.

Letter returned unclaimed from former office, Nogales, Ariz. Allen T. Bird, president; L. C. Frank, vice-president and general manager; M. E. Hopwood, secretary; John M. Woodrum, treasurer. Organized August 17, 1905, under laws of Arizona, with capitalization \$1,000,000, shares \$5 par. Lands, sundry properties, in the Ures district, between Hermosillo and Guaymas.

MINA SOQUITE PRIETO.

MEXICO.

Mine office: Ayutla, Jalisco, Mexico. Lands, 150 pertenencias, showing

auriferous and argentiferous copper ores. Has a 35-ton mill, and at last accounts planned enlarging same.

JOSÉ SOSSI.

BOLIVIA.

Office and mine: Coro Coro, La Paz, Bolivia. Is a small operator, having a mine equipped with steam power and employing 30 men, at last accounts. **COMPANHIA MINEIRA DE SOTIEL CORONADA.**

SPAIN.

Offices: Rua dos Sapateiros 22, Lisbon, Portugal. Mine office: Calañas, Huelva, Spain. Senhor Dom Augusto Fuschini, chairman; Thos. Morrison, & Co., agents at Calañas. Lands, 666 hectares, including 34 old mines, carrying cupriferous iron pyrites. Is working steadily, in a rather small way. Production, 1904, was 14,994 long tons cupriferous pyrites and 614 long tons cement copper, estimated as equivalent to circa 1,000,000 lbs. fine copper. **SOCIEDAD ANONIMA MINAS DE SOTO.**

SPAIN.

Office: Bilbao, Spain. Mine office: Reinosa, Santander, Spain. Idle. **SOUTH AFRICAN COPPER ESTATES, LTD.**

CAPE COLONY.

Dissolved, September, 1904.

SOUTH AFRICAN GOLD & COPPER MINING SYNDICATE, LTD.

TRANSVAAL.

Offices: 237, Finsbury Pavement House, London, E. C., Eng. E. G. Knights, chairman; E. C. C. Smith, secretary. Organized Nov. 24, 1903, with capitalization £15,000, shares £1 par, in £10,000 preferred and £5,000 ordinary shares; issued, all preferred shares, £10,000. Lands, 11,300 acres, held under option, southeast of Petersburg, in the Zoutpansberg district, Transvaal. It is stated that gold and copper ores have been found.

SOUTH AMERICAN DEVELOPMENT CO.

PERÚ.

Succeeded, circa 1903, by Cerro de Pasco Mining Co.

SOUTH AUSTRALIAN COPPER SYNDICATE, LTD.

Offices: 13, St. Helen's Pl., London, E. C., Eng. Moribund.

SOUTH BISBEE COPPER MINING & TOWNSITE IMPROVEMENT CO.

ARIZONA.

Wound up, 1904. Lands sold to Lake Superior & Pittsburg Mining Co. **SOUTH BUTTE COPPER MINING CO.**

MONTANA.

Office and mine: 47 East Broadway, Butte, Montana. P. J. Gilroy, president; W. J. Kemper, treasurer; F. E. Whitehead, secretary; James Davidson, general manager.

SOUTH CANANEA COPPER MINING CO., S. A.

MEXICO.

Is the Mexican corporation of the Pennsylvania & Cananea Copper Co. **SOUTH COLUMBUS MINING CO.**

UTAH.

Office: care of Walter L. Maas, secretary and treasurer, Salt Lake City Utah. Mine office: Park City, Summit Co., Utah. Anthony O. Jacobson, president; J. Alexander Jacobson, vice-president; Arthur Snow, manager. Organized Feb. 11, 1904, as successor of the Centennial-Bingham Mining Co., with capitalization \$300,000, shares \$1 par. Lands, 70 acres, also 6 acres surface rights, circa 4 miles from Park City. Development is by a 1,050' tunnel, showing slightly auriferous and argentiferous copper and lead sulphides, averaging circa 3.5% copper. Was idle at last accounts.

SOUTH-EAST AFRICA, LTD.**MOZAMBIQUE & ZAMBESIA.**

Offices: 84, Bishopsgate St., London, E. C., Eng. Dr. Carl Peters, managing director; T. M. C. Steuart, secretary. Organized July 11, 1898, as Dr. Carl Peters' Estates & Exploration Co., Ltd., and name changed to present title, October, 1903, with capitalization £150,000, shares £1 par; issued, £108,330. Debentures, £10,000, at 6%. Has the right to locate 500 claims, of 500 acres each, on the lands of the British South Africa Chartered Company, and a similar number of claims, of similar area each, on lands of the Mozambique and Zambesia companies, and has located 100 copper claims and 305 gold claims, on which some exploratory work has been done.

SOUTHERN COPPER CO.

Organized, February, 1905, under laws of Maine.

SOUTHERN COPPER MINING CO.**UTAH.**

Office: care of J. M. Reynolds, secretary, treasurer and general manager, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. J. K. Persons, president; B. J. Persons, vice-president; Ed. Mills, superintendent. Organized, May, 1905, under laws of Utah, with capitalization \$300,000, shares \$1 par.

Lands, 5 claims, area 100 acres, surveyed for patents, known as the Brooklyn group, circa 10 miles north of Milford, adjoining the Wahsatch King Mining Co. Development is by a 60' shaft and 20' tunnel, latter cutting a vein carrying fair values in copper, silver and gold.

SOUTHERN PACIFIC GOLD & COPPER MINING CO.**UTAH.**

Office: care of J. W. Burnham, secretary and manager, Salt Lake City, Utah. Capitalization \$300,000, shares 50c. par. Lands, in the Sierra Nevada district, Box Elder county, Utah, are said to show high-grade ores, carrying good values in gold, silver and copper.

SOUTHERN SMELTING & REFINING CO.**TEXAS.**

Letters returned unclaimed from alleged office in New York, and from alleged works office, El Paso, Texas. Louis Strauss, president. Was said, October, 1905, to have taken the Federal smelter, at El Paso, under lease, with option of purchase. Presumably abortive.

SOUTHERN SONORA DEVELOPMENT CO.**MEXICO.**

Office: 135 Adams St., Chicago, Ills. Mine office: Alamos, Sonora, Mexico. Employs 25 men. Frederick E. Mills, president; L. W. Winchester, vice-president; L. E. Ballou, secretary; A. P. Ballou, treasurer and general manager; preceding officers, F. B. Smith and W. W. Strong, directors; J. R. Hendra, superintendent. Organized July 1, 1904, under laws of Arizona, with capitalization \$1,000,000; shares \$1 par; issued, \$550,000. Lands, 28 pertenencias, area 69 acres, held under name of San Bernardino Mining Co., which presumably is the Mexican incorporation, in the Alamos district, showing country rocks of granite and diorite, carrying various fissure veins, of which the Santo Domingo vein is of 14' average width, and is traceable 3,200'; the Quebradilla vein is estimated at 15' average width, and the Santa Ana at 8' average width. Development is by a 300' shaft,

with 360' of workings, estimated to show 15,000 tons of carbonate ore, assaying 2% copper, 5% lead, 67 oz. silver and \$42 gold per ton. Equipment includes an 80-h. p. hoist, good for 1,500', a store, assay office and mill, latter not in use. Company plans installing a 100-ton concentrator.

SOUTHERN STAR COPPER & SMELTING CO.

Letter returned unclaimed from former office, St. James Bldg., New York.
SOUTHERN ZINC & COPPER MINING CO. **ARKANSAS.**

Office: 708 University Ave., Rochester, N. Y. Mine office: Gillham, Sevier Co., Ark. E. J. Morley, president; E. S. Osborne, assistant secretary and general manager. Organized May 3, 1903, under laws of Arkansas, with capitalization \$2,000,000, shares \$100 par. Lands, 700 acres, in the Gillham district, opened by shafts of 135' and 170', said to show zinc ores. Is supposed to have a small milling plant. Was in debt, at last accounts, and presumably is idle.

SOUTH KEARSARGE MINE.

MICHIGAN.

Owned by Osceola Consolidated Mining Co.

SOUTH MOUNT LYELL MINING CO., LTD.

TASMANIA.

Offices: 153, Leadenhall St., London, E. C., Eng., and 320, Collins St., Melbourne, Victoria, Australia. Mine office: Gormanston, Montagu Co., Tasmania. G. Moore, acting chairman; H. M. Taylor, secretary in London; N. Madden, secretary in Melbourne; J. Ryan, mine manager. Capitalisation, £600,000; issued, £496,150, shares £2 par, non-assessable. Lands, 93 acres on Mt. Lyell and 80 acres on Mt. Darwin, former carrying 4% to 6% sulphide ore. Has shafts of 90' and 718' and a 703' main tunnel. Idle since June 1, 1903, apparently with slight prospects of resumption.

SOUTH PEACOCK MINING CO.

IDAHO.

Office: 88 State St., Boston, Mass. Mine office: Weiser, Washington Co., Idaho. Thos. S. Wentworth, president; Wm. L. Pratt, secretary. Capitalization, \$500,000. Lands are in the Seven Devils district. Idle.

SOUTH RANGE MINING CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office; Houghton, Houghton Co., Mich. R. R. Goodell, president; H. W. Wesson, treasurer; F. W. Nichols, secretary. Capitalization \$2,500,000, shares \$25 par. Lands, circa 7,000 acres, undeveloped, lying mainly between the Globe and Belt properties, in Houghton and Ontonagon counties, Michigan, and so located that future mining companies, carved out of new territory in this district, will have to see the South Range company, or organize with very jagged outlines, in many cases.

SOUTH SIDE MINING CO.

MICHIGAN.

Office: care of John C. Watson, president, 68 Devonshire St., Boston, Mass. Mine office: care Fred W. Nichols, agent, Houghton, Houghton Co., Mich. C. O. Burbank, secretary and treasurer. Reorganized April, 1899, under laws of Michigan. Annual meeting, first Monday in March. Lands, circa 200 acres, lying west of the Dakota and north of the Naumkeag, immediately west of Houghton, with one half mile frontage on Portage Lake. Mining operations were confined to a little exploratory work, done many years ago.

SOUTH THARSIS MINE.**TASMANIA.**

Sold to Mt. Lyell Mining & Railway Co., Ltd.

SOUTHWEST AFRICA CO., LTD.**DAMARALAND.**

Offices: 3, Laurence Pountney Hill, London, E. C., Eng., and Unter den Linden 35, Berlin, Germany. E. Davis, chairman; C. Launspach, secretary. Organized Aug. 18, 1892, with capitalization £2,000,000, shares £1 par; issued, £1,200,000. Property is mineral concessions covering 22,000 square miles, including nearly 4,500 square miles of freehold, in Damaraland, and mining rights to 23,000 square miles in Ovamboland, total holdings including 40,000 square miles of freehold, with mining rights over 90,000 square miles additional, also sundry railroad concessions. It is planned to build a railway, to reach the very promising copper deposits on this company's holdings, in Damaraland.

SOUTHWESTERN CONSOLIDATED SMELTING CO.**CALIFORNIA.**

Office: 39 Cortlandt St., New York. F. C. Kaye, president; J. C. De Wolfe, treasurer; J. W. Thompson, secretary; E. Homer Grasty, manager. Organized August, 1904, with capitalization \$2,000,000, shares \$1 par. Company is said to have planned building a smelter somewhere in California. Apparently is merely a stock-jobbing device, promoted by Messrs. Kaye, DeWolfe & Co.

SOUTHWESTERN COPPER & IRON CO.**NEW MEXICO.**

Lands are leased to Burro Mountain Copper Co.

SOUTHWESTERN GOLD & COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office and mine, Douglas, Cochise Co., Ariz.

SOUTHWESTERN MINE & SMELTING CO.**ARIZONA.**

Dead. Was organized, 1903, to build a custom smelter at Gleeson, Cochise county, Arizona.

SOUTHWESTERN MINING CO.**MEXICO.**

Office: 6 Berbting Bldg., South Bend, Ind. Mine office: La Cananea, Arizpe, Sonora, Mexico. Employs 25 men. A. B. Wiekiger, president; A. B. Wadleigh, vice-president and general manager; D. Miller, second vice-president; Hon. Dudley N. Shiveley, secretary; B. K. Morse, superintendent; F. G. Conklin, treasurer; preceding officers, E. E. Bondurant, C. A. Bondurant, S. M. Robinson, Geo. Young and N. E. Bailey, directors; Geo. A. Laird, consulting engineer; Pedro Robles, general counsel. Organized 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$5 par. Operates through the Ortega Mining Co., S. A., which is the Mexican incorporation. American Trust Company, South Bend, Indiana, registrar.

Lands, 342 hectares, known as the Huerfano group, 6 miles southeast of La Cananea. Country rocks are quartzite, quartz-porphyry, altered rhyolite and altered limestone, somewhat similar to the formation at Cananea, carrying an 800' ore zone, opened by a 150' shaft, showing ores giving good assay values in copper, lead and silver. Active development was begun January, 1906.

SOUTHWESTERN SMELTING CO.**CALIFORNIA.**

Letter returned unclaimed from alleged works office, Oro Grande, San Bernardino Co., Cal. Presumably dead.

SOUTHWESTERN SMELTING & REFINING CO.**ARIZONA.**

Office: 302 Mills Bldg., San Francisco, Cal. Mine office: Johnson, Cochise Co., Ariz. Works office: Benson, Cochise Co., Ariz. Riley A. Boggess, president; A. J. Pidgeon, vice-president and general manager; Franklin Bowring, secretary; Walter L. Wiley, treasurer; Doane Merrill, assistant treasurer, smelter superintendent, and resident manager; preceding officers, S. H. Cummings and J. W. Wynne, directors; Mort Wien, superintendent; R. M. Johnson, mill superintendent. Organized 1904, under laws of Arizona, with capitalization \$500,000, shares \$10 par, in \$100,000 preferred 7% stock and \$400,000 common stock. Company succeeded the Empire Smelting Co., and holds title to mining lands, at Johnson, through the Arizona-Michigan Development Co., mine being described under that title.

The smelter-site, 80 acres, at Benson, is on the Southern Pacific railroad. The smelter has a 250-ton water-jacket blast-furnace and a 75-ton Kirk reverberatory furnace, burning petroleum. This plant never has been operated. Equipment of the smelter includes a Vezin 500-ton automatic sampler and a 35-h. p. General Electric motor. The sampler treated 600 tons of milling ore, March, 1905, and was then closed down, awaiting the development of the mine, through lack of capital to purchase ore. Company hopes to start up the sampling mill and smelter, late in 1906.

SOUTHWEST SMELTING & REFINING CO.**NEW MEXICO.**

Office: 517 Francis St., St. Joseph, Mo. Mine and works office: Orogrande, Otero Co., N. M. Employs 200 men. Geo. J. Green, president; Robert G. Mullen, vice-president and general manager; T. G. Travis, secretary and treasurer; Wm. A. Evans, assistant treasurer; Daniel B. Hunt, assistant secretary; preceding officers, Manfred M. Riggs, Arch. M. Woodson, John E. Lonsdale, Charles B. Hughes, Clinton P. Cockrill, Joseph P. Standley and Ichabod McCord, directors; J. S. Airheart, superintendent. Organized December 5, 1904, under laws of New Mexico, with capitalization \$750,000, shares \$100 par. Bonds, \$150,000 authorized and issued, at 5%. Statement, as of date April 1, 1906, gave cash on hand, \$195,000, without accrued liabilities. Annual meeting, third Tuesday of November. Company is practically a close corporation, and controls a number of allied and subsidiary corporations, including the New Mexican Land & Developing Co., which owns the townsite of Orogrande. Company succeeded to the holdings of the Three Bears Mining Co., and has added another mining properties, and is building a large reduction plant.

Lands, 36 claims, area 720 acres, also an 80-acre smelter-site and a 640-acre townsite, giving total holdings of 1,440 acres, in the Silver Hill district of Otero county and the Organ district of Donna Ana county, New Mexico. The principal holdings are in the Silver Hill district, in the Jarilla Mountains, circa 60 miles north of El Paso, and in addition to copper lands, the company holds sundry placer gold claims. The smelter-site is $\frac{3}{4}$ mile from Jarilla

Junction, on the main line of the El Paso & Northeastern Railroad. The company also owns a mine of auriferous iron ore, highly desirable for fluxing.

Country rocks are limestone and porphyry, carrying 16 different contact veins, of which 7 have been more or less developed, these ranging from 3' to 40' in width, with known lengths of 100' to 700', carrying native copper, cuprite, malachite and various sulphide ores, giving average assays of 7% copper, 2 oz. silver and \$5 gold per ton. Principal mining properties are the Lucky, Nanny Baird and Iron Mask mines.

The Lucky mine is opened by a 300' main working shaft, and by tunnels of 250' and 625', said to show a large amount of auriferous copper ore, averaging about 7% copper and \$6 gold per ton. The mine has a 500' tramway, leading to the railroad track.

The Nanny Baird mine is opened by a 100' vertical shaft and an 800' incline shaft. This property shows a vein of about 25' average width, carrying small copper and silver values, and good gold values. It is planned to sink a 2-compartment vertical working shaft and equip same with a modern hoist. South of the Nanny Baird is a placer gold tract of promise. The Lucky and Nanny Baird, jointly, have 5,025' of underground workings, estimated to show 100,000 tons of ore of good average grade blocked out for stoping.

The Iron Mask mine, on Iron Mountain, produces 60% iron ore, carrying \$2 to \$8 gold per ton, with an average of about \$3 to \$4. The company also owns a limestone quarry, for flux, which has been stated, in the press, to carry 80 cents to \$6 gold per ton, which seems almost too good to be true. It is planned to reach the Iron Mask by a railroad spur.

Water is a scarce and valuable commodity in the Jarilla district, and the company is endeavoring to secure same by an artesian well of 2,000', but is taking no chances on the well proving successful, and is to pipe water to the smelter, from the Sacramento river. A 10,000,000-gallon dam is to be built across the river, in the Sacramento Mountains, and a 6" pipe line will carry this water, for 21 miles, to a 25,000,000-gallon reservoir on the side of Baird Hill, just above the townsite. The daily flow of the river is said to be 10,000,000 gallons, and water will be delivered under a head of 1,500', at 800 lbs. pressure per square inch, hence should be capable of developing considerable power.

The mining plant includes three 85-h. p. boilers, two 8x10' hoists, good for 800' each, and 2 Sullivan air-compressors, of 28 drills aggregate capacity, also 23 power drills. The company has 22 buildings, including 4 smithies, a 20x40' machine shop, general store, offices, laboratories, etc.

The townsite of Orogrande, owned by the company, has been built up quite rapidly. This has electric light and telephone service, maintained by the company.

The smelter, which is about 1½ miles from the mine, is of 400 tons daily capacity, having two 200-ton blast-furnaces. The furnace building is of steel, of good design. The power plant at the smelter includes 3 Heine 150-h. p. boilers, two 120-h. p. Filer & Stowell Corliiss high-speed engines and two No 8

Connersville blowers. The smelter stack is 125' high, of 14' diameter at the base and 9' at the top. The smelter is reached by a private spur track from the El Paso & Northeastern railroad, and is connected, by a branch line, with the mines. It is proposed to rebuild the tracks from the smelter to the mines, and extend same to the Iron Mask mine and the limestone quarry. The property is well located for the receipt of coal and coke, latter costing \$6 per ton.

This is one of the most ambitious independent smelting enterprises in the southwest. The plant is well designed and is being well built. The location is good, and there is no reason apparent why the company should not do a large and profitable business, as it seems under good management, and adequately financed. It was hoped to blow in the smelter by September, 1906.

SOUTH WHEAL CROFTY CO.

ENGLAND.

Offices and mines: Carn Brea, R. S. O., Cornwall, England. F. Harvey, chairman; C. H. Paull, purser. Is operated on the cost-book plan, with 6,120 shares. Has tin and copper mines, near Illogan, equipped with a mill having 60 stamps and 14 vanners.

SOUTH YALE COPPER CO., LTD.

BRITISH COLUMBIA.

Mine office: Grand Forks, Yale district, B. C. Frederick Keffer, manager. Organized January, 1905, under laws of British Columbia, with capitalization \$450,000, shares \$1 par.

SOUTH YUBA MINING & SMELTING CO.

CALIFORNIA.

Mine office: French Corral, Nevada Co., Cal. Lands, sundry claims, in the vicinity of French Corral, showing copper ores, said to be under bond to San Francisco parties, who plan erecting a smelter.

SOVEREIGN COPPER MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Battle, Wyo.

J. SOWELL & CO.

OREGON.

Mine office: Althouse, Josephine Co., Ore. Lands, sundry copper claims, slightly developed by tunnel. Idle at last accounts.

SPANISH COPPER CO., LTD.

SPAIN.

Offices: 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: San Vicente, via Paimogo, Huelva, Spain. Organized June 8, 1883 with capitalization £150,000, shares £10 par; issued, £110,000. Chas. A. de Mancha, chairman; Wm. H. Nash and Miguel Yglesias, directors. Lands, 16 claims, area upwards 400 acres, 6 claims, area 200 acres perpetual leasehold, being held on an annual rental of £400, also 23 acres miscellaneous lands, in the Paimogo district of Huelva, showing 6 contact veins between porphyry and clay-slate, of which 3 are being developed, these averaging 30' width and 500' length, opened by numerous shafts of 30' to 165' depth, and 14 tunnels, longest 1,840', estimated to show 2,500,000 tons of ore, with 100,000 tons blocked out for stoping. Ore is mainly cupriferous pyrites, said to average about 4% copper, 3 oz. silver and \$2 gold per ton. Mines were first opened by the Phoenicians, reopened 1862, and again in 1872, 1883, 1901 and 1905. The Gaudina railroad is 5 miles distant.

SPANISH MINERALS DEVELOPMENT, LTD.**SPAIN.**

Offices: 157, Cannon St., London, E. C., Eng. Mine office: Almonáster, Huelva, Spain. J. B. White, chairman; S. Vivian, managing director; W. E. Hopper, secretary. Organized Sept. 4, 1900, with capitalization £150,000, shares £1 par; issued, £118,750. Lands, 476 acres, including the Angostura, Esperanza, Forzosa and other mines, carrying cupriferous iron pyrites. Has stripped the overburden from the Angostura mine, and plans beginning production during 1906.

SPAR COPPER MINES & TUNNEL CO.**COLORADO.**

Office: care of F. N. Stiles, president and general manager, Denver, Colo. E. A. Stiles, secretary; F. W. Downs, treasurer. Organized June 17, 1904, under laws of Colorado, with capitalization \$600,000, shares \$1 par. Lands, 9 claims, on Contact Mountain, Tomichi district, Gunnison county, Colorado, formerly known as the Morning Glim, having circa 1,500' of workings, with gasoline power and 3 mine buildings. Is said to have produced upwards of \$75,000 worth of ore, in the past.

SPARONE MINES.**ITALY.**

A group of small producers, in Piedmont, Italy.

SPASSKY COPPER MINE, LTD.**SIBERIA.**

Offices: 60, London Wall, London, E. C., Eng. Mine office: Akmolinsk, Kirghiz Steppes, Siberia. Employs 1,500 men. Arthur Fell, M. P., chairman; preceding officer, F. H. Hamilton, H. A. Scott, J. Depelley and H. Moser, directors; Ernest Carnot, vice-chairman; John A. Clark, secretary; Union Bank of Scotland, Ltd., bankers; Arthur Fell and Ludwig Ehrlich, trustees for debentures holders; Ernest Nelson Fell, general manager; H. W. Mussen, mine superintendent; E. G. N. North, smelter superintendent; Pellew, Harvey & Fell, consulting engineers. Organized July 9, 1904, under laws of Great Britain, with capitalization £300,000, shares £1 par; issued, £275,000, fully paid. Debentures, £120,000 authorized, at 5%; issued, £102,400. Property was bought for £200,000 stock and £110,000 cash.

Lands, 100 square miles, including the Yuspenski mine, lying circa 160 miles south of Omsk on the Siberian railway, and the Spassky smelter, 72 miles from the mine. The lands of the company carry copper, gold, iron and limestone, and, in addition to the Yuspenski, there are sundry idle mines, in the vicinity of the smelter.

The Yuspenski mine shows a network of veins, occurring near the contact of slate and acid igneous rocks, ore being mainly sulphide. The two main veins, known as the Annensky and Vladimir, are about 200' distant, and substantially parallel, hence it is thought that the two may join at depth. The mine has 35 different shafts, mostly shallow and in extremely bad condition, the mining practice of the former owners having been of the most rudimentary nature. Under the previous ownership timbering costs averaged \$1.25 per ton of ore mined, and timbers were subject to frequent crushes, owing to bad mining, after which new timbers were installed inside of the old, with the result of eventually reducing the mine openings to impassable dimensions. The main shaft, known as the Annensky, is 350' deep, sunk

vertically in the footwall and connected with the vein by crosscuts. The bottom level, at 350', shows a vein of 38' extreme and 15' average width, carrying ore that has given actual smelter returns, under the present management, of 21.77% copper. This vein apparently is merely the paystreak of a vein of immense width, a crosscut on the bottom level showing, in addition to the paystreak, 651' width of vein-matter, carrying declining copper values, ending with circa 1% copper, at the extreme end of the crosscut. It is probable that much of the vein hitherto untouched will be found workable, eventually. At one point the former owners had mined out the chalcopryite, leaving a wall, showing slickensides, of what they considered slate, but which, upon investigation by the present management, proved to be a vein of massive chalcocite. Ore values are mainly in chalcocite, bornite and chalcopryite with a little tetrahedrite, and gangue of quartz and barite, but the upper workings show more or less native copper, cuprite, malachite and azurite. The Yuspenski has been worked, in a primitive manner, since circa 1865, the original development having been by an open pit, once 150' deep, but long long since caved in.

The old equipment at the mine was of a most primitive nature, and is being replaced by a modern plant. In addition to necessary shops, the company maintains schools, baths, a hospital and a church for workmen and their families. Transportation between the mine and smelter formerly was exclusively by carts, but the present company has bought a traction engine and ore-wagons. So much ore was lost in transit formerly, that the track of the ore-carts is emblazoned by a purple train of bornite, visible for several miles distance.

The coal mine, circa 20 miles from the smelter, shows two coal seams, of 60' and 65' thickness. The coal mine promises to be of commercial importance, in addition to furnishing all fuel for the mines and works, and the company plans building a railroad between the smelter and the coal field. Subsidiary companies may be formed, for the construction of the 72 miles of railroad required between mine and smelter, and for the development of the coal mines.

The old smelting plant was poorly designed, in bad condition, and remarkably inefficient, but has been patched up, until such time as the new plant can be constructed. The former practice scarcely could have been improved on for badness. The ore was heap-roasted with coal, the process requiring 3 weeks, and as the heaps were located on the top of a hill where furious winds prevailed, there was much cintering, and heavy losses. The old smelter had 6 rectangular brick furnaces, of $2\frac{1}{2}$ tons daily capacity each, and so poor was the former practice that a smelter charge of 16 tons of ore required 54 tons of fuel and flux for its reduction. Matte was run onto the casting floor, of sand, with frequent pools of water, causing alarming explosions, and only about half of the matte was removed by tapping, the balance having been run out by hand. The slags ran about 3% copper, and were fed back into the furnace repeatedly.

The new smelting plant, on the way, July, 1906, is designed for a

productive capacity of 300 long tons fine copper monthly, and includes blast-furnaces and a converter plant. It is hoped to have the new smelter in blast before the close of the year. There are about 100,000 tons of very rich slags at the old works which will be resmelted later.

From July, 1904, to September, 1905, inclusive, 8,824 long tons of ore were smelted, giving average assay values of 21.77% copper, with an average monthly production 64 long tons of fine copper monthly. For the last 3 months of 1905, production averaged 105 long tons fine copper monthly. and production for 1905 is estimated at 2,500,000 lbs. fine copper, product being high-grade blister copper, assaying 99.6% fine. The Russian government has a protective tariff duty of practically 5 cents per pound on copper, and the Russian mines supply not to exceed 40% of the domestic consumption. Notwithstanding the disadvantage of a badly opened mine, an entirely inefficient and antiquated smelter, and long distance from railroad transport, the company made a profit of £33,000 on the first 15 months' operations, and with a modern plant and mining practice, profits should be very large. The management is good, and the Yuspensski mine is much the most promising copper mine of the Russian Empire, and scarcely is exceeded in promise by any new copper property of the world.

SPECULATOR MINING CO.

MONTANA.

Property sold, 1905, to North Butte Mining Co.

DR. JAS. SPENCE & CO.

OREGON.

Office and mine: Kerby, Josephine Co., Ore. Dr. Jas. Spence, general manager; C. W. Spence, superintendent. Lands, 11 claims, area 220 acres, showing country rocks of diorite and porphyry, carrying sundry veins, of which 4, under development, are estimated to be of 4' to 100' width, showing cuprite, melaconite, malachite, azurite and chalcopyrite, latter predominating, giving assays of 3% to 25% copper, 1 oz. to 6 oz. silver and \$2 to \$10 gold per ton. Development is by a shaft of 100' and by tunnels of 700', 140', 230', 180' and 175', with a total of 1,500' of workings. Management plans continuing main tunnel to a length of 2,000', equipping same with tram-track and making sundry surface improvements. The intention is to develop the mine thoroughly before erecting a reduction plant, which is a sound plan of operation.

SPENCE MINERAL CO.

CALIFORNIA.

Office: San Francisco, Cal. Mine office: Spenceville, Nevada Co., Cal. Chas. W. Howard, Jr., general manager. Is an old mine, operated since circa 1875, until main shaft caved in, 1903. Ores are auriferous and argentiferous sulphides, averaging about 5% copper and 45% to 50% sulphur, occurring in wide, irregular fissures, near the contact of diorite and granodiorite.

SPENTAZUMA COPPER CO.

ARIZONA.

The notorious Dr. R. C. Flower began his career as a fake promoter by organizing this company, which was supposed to have lands in the vicinity of Duncan, Graham county, Arizona. Dead, and safely buried, past hope of resurrection, under a mountain of debts.

SPITZEE GOLD MINES, LTD.**BRITISH COLUMBIA.**

Reincorporated, August, 1905, as Spitzee Mining Co., Ltd.

SPITZEE MINING CO., LTD.**BRITISH COLUMBIA.**

Mine office: Phoenix, Yale district, B. C. Organized 1905, as successor of the Spitzee Gold Mines, Ltd., under laws of British Columbia, with capitalization \$350,000, shares \$5 par. Property produced, to September, 1905, circa 5,000 tons of ore, averaging \$12 per ton in value, and was said, at that date, to have circa 30,000 tons of ore in sight. Management seems satisfactory and property is well regarded.

SPOKANE COPPER CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Cle Elum, Wash.

SPOKANE MINE.**WASHINGTON.**

Letter returned unclaimed from former mine office, Twisp, Wash.

SPONDULIX MINE.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. A. D. Bullis, owner. Has auriferous and argentiferous copper ores, opened by shaft.

SPRINGDALE COPPER MINING CO.**OREGON.**

Mine office: Athena, Umatilla Co., Ore. Idle.

SPRINGFIELD GOLD & COPPER MINING CO., LTD.**IDAHO.**

Office and mine: 720 Bank St., Wallace, Shoshone Co., Idaho. Wm. Lively, president; D. A. McKenzie, vice-president and manager; Jos. T. Whelan, secretary. Capitalization \$100,000, shares 10 cents par. Lands, 4 patented claims, area 80 acres, well timbered, in the St. Joe district, showing 2 fissure veins, opened by about 1,100' of tunnels, longest 860', showing a 13' vein of ore, carrying estimated values of \$22 per ton. Presumably idle.

SPRINGFIELD-MEXICAN MINING CO.**MEXICO.**

Office: 213½ South Sixth St., Springfield, Ills. Mine office: Unión de Tula, Jalisco, Mexico. Employs 25 men. Geo. F. Stericker, president; Geo. M. Morgan, vice-president; Harvey C. McCann, secretary; Alfred Orendorff, treasurer; Gerald G. Hereford, superintendent; Arthur Hay, engineer. Organized June 3, 1903, under laws of Arizona, with capitalization \$500,000, shares \$1 par; issued, \$425,000. Annual meeting, third Tuesday in May.

Lands, 25 pertenencias, area 62 acres, in the Ayutla district, including the Concepción group of 16 pertenencias, 6 miles south of Ayutla, showing 3 veins, of 4' average width, with circa 1,000' of workings. The various properties of the company show 7 veins, reported as fissures in porphyry, of 7' average width, carrying malachite, azurite, bornite and chalcopryrite, giving average assays of 7% copper and 12 oz. silver per ton. Development is by shafts of 220', 58', 86', 25', 100' and 175', and by 8 tunnels, 2 longest 258' and 340', with a total of 582' of underground workings, estimated to show 10,000 tons of ore blocked out for stoping. Property is an antigua, closed 1821 and reopened 1903. Equipment includes a 30-h. p. steam plant and 6 mine buildings. Nearest railroad is the Mexican Central, 40 miles distant. Company has shipped a little high-grade ore, in 10-ton lots, for mill tests, to the National Metal Co., at Ameca and Guadalajara. Management plans continuous development and the erection of a concentrator.

SPRINGFIELD MINE.

An old and idle property in Carroll county, Maryland.

MARYLAND.**SPRING GULCH GOLD MINING CO.****COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. B. MacFarlane, superintendent, at last accounts. Property is the Banty group, carrying auriferous and cupriferous silver-lead ores. Has gasoline power.

STADTBERGER HÜTTE ACTIEN GESELLSCHAFT.**GERMANY.**

Office: care of Otto Meurer, president, Köln, Germany. Mine office: Nieder Marsberg, Westfalen, Germany. Obersteiger Speiss, manager. Employs circa 450 men. Capitalization, 2,250,000 marks. Was known formerly as Stadtberger Gewerkschaft, working since A. D. 1150. Has 3 mines, the Minna and Friederike, active, and the Oscar, idle. Plant includes concentrator and smelter. New deep shafts are being sunk at all three of the mines. Production averages circa 45,000 metric tons yearly, of ores giving average returns of 1.8% copper. Production, 1905, was 1,609,358 lbs. fine copper.

STANDARD CONSOLIDATED COPPER CO.**ARIZONA.**

Office: 43-52 Wall St., New York. Mine office: Clifton, Graham Co., Ariz. John K. Erskine, president; M. Gould, secretary and treasurer; preceding officers and Geo. Frazer, directors. Organized 1903, under laws of Maine, with capitalization \$1,500,000, shares \$10 par. Is a holding company, controlling various subsidiary corporations through stock ownership. Shareholdings include \$292,515 capital stock of the Standard Copper Mines; 140,000 shares of the capital stock of the Clifton Copper Mines, Ltd., and 26,107 shares of the capital stock of the Coronado Copper Mining Co., control of latter being held by the Shannon Copper Co. The Standard Consolidated Copper Co. also owns the San José mine, and the Los Angeles group.

Lands owned and controlled by the company are all more or less contiguous, lying on both sides of Chase creek, for $1\frac{1}{2}$ miles, on the line of the Coronado railroad, 5 to 6 miles north of Clifton.

The Standard mine, 5 claims, area 99 acres, is extensively developed by open-cast workings, with about one mile of underground openings, on a vein of 2' to 4' width, carrying very rich ores, ranging from 16.5% to 51% in copper tenor, with an actual smelter average of probably about 20%.

The Coronado group, 7 claims, adjoins the Standard and is supposed to carry a continuation of the Standard ore body.

The San José group, 3 claims, area 48 acres, is one mile east of Metcalf, lying west of the Standard group, and south of the King mine of the Arizona Copper Co., showing a 4' to 5' vein of chalcocite, slightly developed, giving high assay values.

The Los Angeles group, 4 claims, area 80 acres, is near Morenci, and circa 2 miles from the San José group.

The Copper Center group, 8 claims, partly patented, has been but slightly developed.

Ore is carried from the Standard mine to the Coronado railroad by a

Leschen aerial tram, of 3,200' length, with a drop of 800', operated by gravity, which transports ore at a cost of circa 5 cents per ton, as against the former cost of \$2 per ton, when shipped by burros. The tram-line has shipping-bins at the lower terminus, on the railroad tracks. Mine equipment consists of a gasoline hoist.

Mr. C. A. Ross, the former president, was arrested on charges of larceny and embezzlement, being accused of confiscating the books of the company, but was exonerated, upon trial. There has been considerable quarreling among the officers of the company, by reason of which its affairs have not been handled to the best advantage, and there seems to be some ground for the charge that dividends were paid before the property was sufficiently developed to warrant such disbursements.

Ore formerly was sent to the Shannon smelter, but, with a change of management, ore is sent, beginning 1906, to the Detroit smelter. Production, 1905, was 1,088,952 lbs. fine copper and 2,620 oz. fine silver, of which 31,853 lbs. copper came from San José mine, and 37,517 lbs. copper came from the Clifton mine. This property is considered meritorious, and it is hoped that under the new management good progress may be made.

STANDARD CONSOLIDATED MINES CO.

OREGON.

Office: Sumpter, Ore. Mine office: John Day, Grant Co., Ore. Zoath C. Hauser, president; H. H. Nicholson, manager; Edw. W. Mueller, secretary; C. B. Wade, treasurer. Organized May, 1903, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Lands, 26 claims, area circa 500 acres, on both sides of Dixie Creek, in the Quartzburg district, with about one mile of workings, showing auriferous and cupriferous cobalt-nickel ores. Is said to plan building a 50-ton concentrator.

STANDARD COPPER CO.

ARIZONA.

Mine office: Casa Grande, Pinal county, Arizona. Lands, 7 claims, 13 miles from Casa Grande. Idle.

STANDARD COPPER CO. OF ARIZONA.

ARIZONA.

Office: 520 Chamber of Commerce, St. Louis, Mo.

STANDARD COPPER MINES.

ARIZONA.

Office: 52 Wall St., New York. Mine office: Clifton, Graham Co., Ariz. Organized February 21, 1901, under laws of Arizona, with capitalization \$500,000, shares \$1 par; issued, \$425,000. Is controlled by the Standard Consolidated Copper Co., through ownership by latter of \$292,515 of issued stock. Paid dividends, to end of 1905, of \$69,500. Lands, 99 acres. Buildings include an engine-house, office, laboratory, smithy, boarding-house, stables, etc.

STANDARD COPPER MINING CO.

WYOMING.

Office: P. O. Box 22, Toledo, Ohio. Mine office: Encampment, Carbon Co., Wyo. Geo. P. Waldorf, president; Alphonse Monnell, vice-president; Joseph M. Spencer, secretary and treasurer, preceding officers Fred O. Paddock, Walter D. Guilbert Peter Parker, Charles E. Winter, Harvey M. Cook and Wm. S. MacKenzie, directors; William L. Sills, superintendent. Organized August, 1903, under laws of Wyoming, with capitalization \$1,500,000,

shares \$1 par; issued, \$1,150,000. Annual meeting, first Tuesday in August. Lands, 6 claims, area 120 acres, known as the Susquehanna group, about $\frac{1}{2}$ mile east of the Itmay group. Country rocks are diorite, quartzite, schist and granite, carrying sundry fissure and contact veins of 10' estimated average width, opened by shafts of 55' and 207', with a total of about 400' of workings, showing malachite, azurite, chalcocite, bornite and chalcopyrite, giving assays of 18% copper and \$2 gold per ton. Equipment includes a hoist, good for 600', and 5 buildings. Idle since December 15, 1905, but company plans resumption during 1906.

STANDARD GOLD & COPPER MINING CO.**OREGON.**

Absorbed, 1903, by Standard Consolidated Mines Co.

STANDARD MINING CO.**CALIFORNIA.**

Mine office: Cima, San Bernardino Co., Cal. Lands, sundry claims, 11 miles from Cima, on the Salt Lake Railroad, and 15 miles from Ivanpah, opened by a 200' shaft, showing carbonate ore near surface, with melaconite and sulphides on the 100' level. Carload shipments have sampled 10.5% copper, 3 oz. silver and \$1.20 gold per ton, ores being taken from the dump. Company planned beginning shipments of 10 tons daily, early in 1906.

STANDARD MINING & REDUCTION CO.**MONTANA.**

Office and mine: 109 East Broadway, Butte, Silver Bow Co., Mont. John H. Lynch, president; C. W. Siglar, vice-president; D. C. Campbell, secretary and treasurer; preceding officers, G. D. Beveridge, C. J. Fellows, F. C. Geiger and C. Woltjen, directors. Organized 1905, under laws of District of Columbia, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, in the Fleecer Mountain district, circa 25 miles southwest of Butte, 5 miles from the railroad station at Divide, with a good wagon road between, slightly developed by 2 shallow shafts, showing ores giving good assay values in copper. Idle at last accounts.

STANLEY BUTTE MINING CO.**ARIZONA.**

Mine office: San Carlos, Gila Co., Ariz. James E. Carpenter, general manager; Harry Pryor, superintendent; Lands, 60 claims, held under bond and lease, opened by a 125' tunnel.

STAR CONSOLIDATED MINING CO.**UTAH.**

Office: 6 Atlas Blk., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Has auriferous and argentiferous copper ores, with steam equipment, and employed circa 25 men, at last accounts.

STAR COPPER MINING CO.**MICHIGAN.**

Office: care of John C. Watson, 68 Devonshire St., Boston, Mass. F. H. Raymond, president; C. O. Burbank, secretary and treasurer. Lands, circa 760 acres, in Sections 9, 10 and 16, Town 58 North, Range 28 West, Keweenaw county, Michigan. Has 2 shafts, deepest 300', on a fissure vein, south of the greenstone, sunk 1851-1857, when company expended circa \$70,000. Since idle.

STARLIGHT MINE.**ARIZONA.**

Owned by Tri-Bullion Smelting & Development Co.

STARLUS COPPER & GOLD MINING CO.

Letter returned unclaimed from former office, Chicago, Ills.

STATE LINE COPPER MINING CO.**WYOMING.**

Reorganized, circa 1904, as State Line Mining Co.

STATE LINE MINING CO.**WYOMING.**

Office: 300 Century Bldg., Denver, Colo. Mine office: Encampment, Carbon Co., Wyo. D. W. Aupperle, president; Hon. S. M. Elwood, vice-president; W. W. Wemott, secretary and treasurer. Organized circa 1904, with capitalization \$1,500,000, shares \$1 par, as a reconstruction of the State Line Copper Mining Co. Lands, 17 claims, area 340 acres, on State Line Hill, in the Encampment district of Wyoming, near the Colorado line, showing a 3' vein of ore, giving assays of 21% copper, from 17 pits and shallow shafts of 10' to 60' depth. Company has started a crosscut tunnel and apparently is in controversy with an adjoining company, over titles.

STAUFFER CHEMICAL CO.**CALIFORNIA.**

Office: San Francisco, Cal. Lands, 80 acres, known as the Alma mine, near Oakland, Alameda Co., Cal., developed mainly by tunnels. Ore is cupriferous iron pyrites, ranging from 1.5% to 3.5% copper, up to 50% sulphur and up to \$2.50 gold per ton, occurring in lenses between serpentine and metamorphosed chert, in a belt traced 3,000'. After burning for sulphur the cinder is leached for copper. Presumably idle.

STEAMBOAT MINING CO.**UTAH.**

Mine office: Brighton, Salt Lake Co., Utah. Presumably idle.

STEMP SPRINGS COAL & POWER CO.**WYOMING.**

Works office: Copperton, Carbon Co., Wyo. Is said to plan building a 250-ton smelter, to treat ores of the Anchoria Copper Co. and other properties of that district.

STEMWINDER MINE.**BRITISH COLUMBIA.**

Owned by Dominion Copper Co., Ltd.

STEPHENSON-BENNETT CONSOLIDATED MINING CO.**NEW MEXICO.**

Mine office: Organ, Donna Ana Co., N. M. J. J. McCullough, general manager. Lands, sundry claims, in the Organ Mountains, opened by a 2-compartment shaft, on a vein carrying argentiferous copper and lead ore. Has steam power, hoist, air-compressor and a 50-ton concentrator.

STEPTOE MINING CO.**NEVADA.**

Property sold, Sept. 4, 1902, to New York & Nevada Copper Co.

STERLING COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, 44 Broadway, New York. Lands were 12 claims, in Graham county, Arizona.

STEVENS COPPER CO.**ARIZONA.**

Office: care of Fred Enos, secretary Bridgeport, Conn. Mine office: Clifton, Graham Co., Ariz. Employs circa 30 men. Henry Setzer, president; Chas. D. Hawley, vice-president; Frederic S. Hunt, treasurer, Chas. E. Stevens, superintendent; F. A. Alsdorf, consulting engineer. Lands, 39 claims, area 780 acres, circa 2 miles from Metcalf. Country rocks are granite, overlaid by Cambrian quartzite and Silurian limestone, with much

faulting, and intrusive porphyrite dykes, ores occurring near the fault-lines. Early in 1906 was shipping ore, running 12% to 30% copper, to the Shannon smelter. Property considered promising.

STEVENS PEAK COPPER MINING CO.**IDAHO.**

Apparently out of business, and presumably dead.

STEWART GROUP.**WASHINGTON.**

Sundry claims, in Ferry county, Washington, circa one mile south of the international boundary line, supposed to have been bonded, 1905, for \$50,000, to Hon. Johnathan Bourne, of Portland, Oregon.

STILLAGUAMISH & SULTAN MINING CO.**WASHINGTON.**

Office: 606 Bailey Bldg., Seattle, Wash. Letter returned unclaimed from former mine office, Silverton, Snohomish Co., Wash. Richard Sykes, president; J. W. Clise, vice-president and general manager; Willis B. Herr, secretary. Organized September 22, 1892, under laws of Washington, with capitalization \$3,000,000, shares \$50 par. Lands, 15 claims, area 575 acres, in the Stillaguamish district, with 1,400' of mine openings, showing low-grade auriferous copper ore. Idle for several years.

STILLMAN COPPER MINING CO.**WYOMING.**

Office: 408-145 La Salle St., Chicago, Ills. Lands supposedly are in the Encampment district of Carbon county, Wyoming. Idle.

STOBIE MINING CO.**ONTARIO.**

Mine office: Desbarats, Algoma, Ont. James Stobie, president; A. B. Upton, vice-president and general manager; John Lear, secretary and treasurer. Organized 1900, under laws of Ontario, with capitalization \$1,000,000, shares \$1 par. Lands, 134 acres, in Block O, Johnson township, Algoma, Ontario showing a vein of 3' to 5' width, carrying chalcocite, bornite and chalcopyrite. A carload of ore, shipped 1901, gave smelter returns of 18% copper. Idle since circa 1901.

STOCKTON COPPER MINING CO.**CALIFORNIA.**

Lands, sundry claims, in the Burney Valley, near Pitt river, Shasta county, California, said to show auriferous copper ores. Idle.

STOCKTON COPPER MINING CO.**COLORADO.**

Office: 312 Bank of Commerce Bldg., Minneapolis, Minn. Mine office: Salida, Chaffee Co., Colo. C. T. Bergh, president; J. W. Allan, secretary; A. E. Chilson, manager, Webster, S. D. Development is by a 225' tunnel, giving a fair showing of carbonate ore, with occasional native copper. Presumably idle.

STOCKTON COPPER MINING CO.**MONTANA.**

Letters returned unclaimed from former office, Butte, Mont., and former mine office, Radersburgh, Broadwater Co., Mont. E. W. Harney, president; P. A. Gamer, secretary; John Rathfus, superintendent. Organized under laws of Montana, with capitalization \$1,000,000. Lands include the Idaho claims, in East Butte, and the North Star group, in Broadwater county, the latter having been a limited producer in the past. Property is considered of value, but company suffers from acute financial debility.

STODDARD COPPER CO.**ARIZONA.**

Mine office: Stoddard, Yavapai Co., Ariz. Robt. J. Campbell, president; John N. Drake, secretary; Isaac T. Stoddard, general manager; John Martin, superintendent. Organized under laws of Arizona, with capitalization \$5,000,000, shares \$5 par. Lands, 16 claims, including the Binghamton mine, some distance from a railroad, opened by shafts, deepest 250' in the Copper Bottom mine, also various tunnels, longest 1,000'. Has secured returns of \$15 to \$26.50 per ton, from smelter shipments. Has a concentrator, Huntington mill and 50-ton smelter, on the Agua Fria river. Good carbonate and oxide surface ores near surface were succeeded by a leached zone, but fair grade sulphide ores have been secured at depth. Property considered promising, but idle, at end of 1905, from lack of funds, though management hoped to resume work on a considerable scale, during 1906.

STONE CREEK COPPER MINING & MILLING CO.**MONTANA.**

Letter returned unclaimed from former office, 818-109 Randolph St., Chicago, Ills. Mine office: Dillon, Beaverhead Co., Mont. G. J. M. Porter, president; B. J. Soper, secretary; A. L. Stone, agent. Organized 1901, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. Lands, 8 claims, area 125 acres, in the Stone Creek district, showing malachite, azurite and low-grade copper outcrops. Has a 60' two-compartment main shaft and 5 shallow pits, also a 130' tunnel. Idle for several years.

STONE HILL COPPER MINES.**ALABAMA.**

An idle property, once worked extensively, in Cleburne county, Alabama.

STONEWALL COPPER CO.**ARIZONA.**

A swindle, perpetrated by the notorious Wm. F. Wernse gang, of St. Louis.

STORA KOPPARBERG BERSLAGS AKTIEBOLAG.**SWEDEN.**

Office, mines and works: Falun, Dalarne, Sweden. Capitalization, 9,600,000 kroner, shares 1,000 kroner par. E. J. Ljungberg, director; Lars Yngström, assistant director and general manager; Th. Witt, mining engineer; K. A. Akerblom, superintendent of leaching plant. Lands, 5 claims, 3 patented and 2 unpatented, area 43 hectares. Mine was worked as early as A. D. 1288, and presumably earlier, oldest privileges of the present company dating from Feb. 24, 1347. Company conducts extensive industrial operations, owning and operating iron and steel plants, a paper mill, pulp-mill, sawmill, etc., in addition to its copper mines and smelters. Has several mines and many ore bodies, largest being the Storrgufa, 370 metres long by 220 metres wide, and about 320 metres deep, mostly mined out, leaving an open pit of circa 220' depth. Ore is chalcopyrite, containing selenium and bismuth, giving average returns of 2.7% to 3% copper, 10 grams to 15 grams silver and 2.5 grams to 3 grams gold per ton. Has 14 shafts, with aggregate depth of 1,800 metres, deepest being 343 metres, with about 33 kilometres of tunnels. Has water power. The copper mine employs about 100 men, and gives a yearly production of about 45,000 tons of raw ore, which, after hand-cobbing, yields about 15,000 tons of leaching ore. The roast stalls are one-half kilometre from the mine, and the leaching plant is one-half kilometre beyond the furnaces, all connected by tram-line.

The roasted ore is crushed with salt, re-roasted and leached with dilute sulphuric acid, in tanks, the metallic contents of the leach-water being precipitated on scrap iron, as cement copper, which is dissolved in sulphuric acid and turned out as bluestone. Yearly production averages circa 300 kgs. silver, 80 kgs. gold and 1,250 metric tons bluestone, equivalent to 300 tons fine copper.

STORRGRUFA MINE.**SWEDEN.**

Owned by Stora Kopparberg Berslags Aktiebolag.

STRATHCONA MINE.**ONTARIO.**

Office: care of J. F. Black, owner, Sudbury, Algoma, Ont. Lands, in Levack township, slightly developed, show copper-nickel sulphides. Idle.

STRATTON GOLD & COPPER MINING & MILLING CO.**COLORADO.**

Organized 1905. Lands, 170 acres, well timbered and watered, in Chaffee and Fremont counties, Colorado, said to be opened by a 200' shaft, showing an 8' vein, giving good assays in copper.

STRICKLEY-MONTEZUMA MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. W. J. Strickley, superintendent. Has auriferous copper ores, and steam power. Idle.

STRONG COPPER CLAIMS CO.**OREGON.**

Lands sold, circa 1901, to Waldo Smelting & Mining Co.

STRONG COPPER MINING CO.**WYOMING.**

Office: 210 Grant Ave., Laramie, Wyo. Mine office: Leslie, Albany Co., Wyo. Employs 25 men. N. E. Corthell, president; E. P. Baker, vice-president and superintendent; I. R. Swigart, secretary, treasurer and general manager. Organized January 12, 1903, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Annual meeting, first Wednesday in January. Lands, 16 claims, area 270 acres, in Section 4, Town 16, Range 71, Albany county, Wyoming, showing a fissure vein in pegmatite, and contact veins between granite and limestone, of which one, with average width of 7', gives average assays of 4% copper, 3 oz. silver and \$3.60 gold per ton, with some lead and molybdenite, from malachite, chalcocite, bornite, chalcopyrite, galena and wulfenite. Mine is opened by about 20 shallow pits and a 335' shaft, and by a 450' tunnel, with 935' of underground openings, estimated to show 10,000 tons of ore. Has a 25-h. p. steam hoist, and plans building a 25-ton concentrator.

DAVID A. STUART.**PERÚ.**

Office and mine: Quicachaca, Yauyos, Perú. Was a small producer of copper, silver, lead and coal, at last accounts.

SUCCESS COPPER MINING CO.**ARIZONA.**

Office: 536 Douglas Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Quartzite, Yuma Co., Ariz. Chas. E. Eichelberger, president; Robert Marsh, secretary and treasurer. Organized 1902, under laws of Arizona, with capitalization \$750,000, shares \$1 par. Lands, 6 claims, area 124 acres, in the Plomosa district, showing 5 contact veins, 2, of 12' average width, carrying oxide and carbonate ores, giving average assays of 15% copper, 40 oz. silver and \$3 gold per ton. Has shafts of 60', 75', 115', and 250',

also a 300' tunnel, with 1,700' of underground openings. Has steam power and planned installing a 50-ton smelter, but failed to do so.

SUGAR LOAF MINING CO.

SOUTH DAKOTA.

Office: care of Drake, Barnes & Co., Cleveland, Ohio. Letter returned unclaimed from former mine office, Custer, Custer Co., S. D. Property was the Richard Palmer mine, which shipped a little low-grade auriferous copper ore, for flux, to the Deadwood smelter, circa 1903.

SUGAR PINE MINE.

OREGON.

Office and mine: care of G. N. Bolt, owner, Galice, Josephine Co., Ore. Ores carry gold, silver, copper and lead. Has water and gasoline power, and a 4-stamp mill. Presumably idle.

SULITELMA AKTIEBOLAG.

NORWAY.

Office and works office: Helsingborg, Malmöhus Län, Sweden. Mine office: Sulitjelma, Nordland, Norway. Employs 1,700 men. Lord-Lieutenant G. Tornerhjelm, president; Consul Nils Persson, vice-president; C. Ingelsson, secretary; Emil Knudsen, general manager; preceding officers, August Sylvan, Thure Röing, R. M. B. Schjölberg, C. E. Hedström and Sture Person Henning, directors; Prof. Hjalmar Sjögren and C. Ingelsson, deputies; H. Holmsen, superintendent; Fredrik Carlson, mine superintendent; P. Kjölseth, mill superintendent; Hans Dyck, smelter superintendent; L. D. Jensen, engineer.

Organized 1890, under laws of Sweden, with capitalization 3,000,000 kroner, increased, 1906, to 6,000,000 kr., shares 500 kr. par. Paid an 8% dividend in 1905, amounting to 240,000 kr., and has paid total dividends, to end of 1905, of 1,800,000 kroner. Annual meeting, in May.

Lands, 291 claims, area 63 acres, also a 1¼-acre millsite and miscellaneous holdings, extensively mineralized, of 193.06 square miles, lying mainly north of the Arctic Circle, in the Skjerstad division of the Tromsø district of Norway, including the Sulitjelma, Carlotta, Geken and Altens groups of mines. The Sulitjelma mine, discovered 1875 and opened 1887, has become the principal copper mine of Norway.

Country rock at the Sulitjelma mine is mica-schist of lower Silurian age, with eruptive flows of greenstone conformable with schists, ore bodies occurring as extended lenses, very persistent in strike and depth, on the contact of the schists with metamorphosed amphibolite and olivine gabbro, lenses dipping from 10° to 45° with the horizon. Ore is exclusively cupriferous iron pyrites, averaging 2.25% copper and 45% sulphur, with small quantities of nickel and 0.5 oz. silver per ton. There are 16 known lenses on the company's lands, of which 9 are undergoing development, these averaging 15' to 36' width, and 450' to 1,500' known length.

Development is mainly by tunnel, there being one shaft of 280' depth and 9 tunnels, the names and number of feet of workings of the latter, at the end of 1905, being as follows: Ny-Sulitelma, 8,940'; Hanka-Bakken, 1,640'; Giken, 15,800'; Carlotta, 11,100'; Måns-Petter, 2,450'; Bursi, 700'; Koch, 2,740'; Tornerhjelm, 3,000'; No. 9, 2,160'. The mine has total openings of 52,000', showing 2,502,000 metric tons of ore, with 953,000 tons blocked out for stoping.

The mine has a 400-h. p. plant, the mill a 390-h. p. plant and the smelter a 560-h. p. plant. The various installations have an aggregate of 1,220 h. p. in electric energy, 260 h. p. in hydraulic energy and 720 h. p. in pneumatic energy. The mines have 9 hoists, 1 Ingersoll-Sergeant, 1 Burchard and 3 Schramm air-compressors, with an aggregate capacity of 28 drills, and 25 power drills are used. The mine buildings are of wood, the machine shop having an area of 1,291 square feet, carpenter shop, 1,291 sq. ft., smithy, 1,722 sq. ft. There is an extensive system of aerial tramways, with 15 stations and 2 power stations. The company also owns 132 dwellings.

The concentrator, of wood, area 37,950 sq. ft., has 6 Blake crushers, 15 F. Krupp Grusonwerk centrifugal crushers, 89 Hartz jigs, 10 Lühlig and Ferrari concentrators, 24 vanners and an Elmore oil concentration plant, the concentrator having a daily capacity of circa 1,000 tons.

The smelter, at Fagerlid, 2 to 5 miles from the various mines, receives ore therefrom by aerial trams, and has a daily capacity of 160 tons. Equipment includes one 50-ton water-jacket blast-furnace, two 50-ton pyritic smelting converters, of the Knudsen type, and one converter stand with 10 shells of the Manhes type, taking 7.5 metric ton charges each. Product of first fusion is a matte of 30% to 40% copper tenor, and final product is a 99.2% blister copper, sent to the Helsingborg Kopparverks Aktiebolag, at Helsingborg, Sweden, for refining. There also is a leaching plant, in connection with the Helsingborg works.

Miscellaneous enterprises of the Sulitelma include 2 sawmills, a general store, 2 schools, a church and a Good Templar's lodge. The transportation system includes 7 steamers, 2 tugs, 40 barges and a private railway system of 13 kilometres length, known as the Sulitjelmabanen, equipped with 3 locomotives and 120 freight cars.

Fuel consumption and costs were as follows, for 1905: 4,950 cords wood, at 7.63 kr. per cord; 5,580 metric tons bituminous coal at 17.4 kr.; 1,177 metric tons coke, at 30 kr.; also 4,950 gallons petroleum. Average mining costs are 7.86 kroner per metric ton, concentrating costs 2.59 kroner, smelting and converting 16.41 kroner, and cost of blister copper is about 650 kroner per metric ton. Ores are divided into two classes, the first grade, or smelting ore, carrying 4% to 8% copper, while the second grade, for export, carries 1.5% to 4% copper, and an average of 45% sulphur, 34% to 36% iron and 2% to 2.5% alumina. Average tenor of all ores is about 3% copper and 45% sulphur. Gross ore production is about 90,000 tons yearly, and, of the sulphur ore exported, about half is fines and half lumps, sent to Helsingborg, Riga, Antwerp, Ghent and various ports in Great Britain.

Production 1904, was 605.3 metric tons fine copper, also 2,532 metric tons fine copper contained in circa 90,000 tons of cupriferous pyrites exported to sulphur-burners. In 1905 the local production was 446.9 tons fine copper, from 10,479.3 tons ore smelted, in addition to the quantity contained in ore exported, giving a total output of 6,225,856 lbs. fine copper. For 1906 the company plans enlarging the concentrator, building a new machine shop and laboratory and enlarging and partially remodeling the smel-

ter, to make further use of the Knudsen pyritic process of smelting, devised by the company's general manager, which is giving most satisfactory results. The management of the Sulitelma is progressive, and the property has by no means reached its productive capacity, though already the largest copper producer of Norway, and one of the important mines of Europe.

SULLIVAN COPPER DEVELOPMENT CO.

ARIZONA.

Office: Duluth, Minn. Mine office: Paradise, Cochise Co., Ariz. Lands, sundry claims, adjoining the holdings of the Manhattan Development Co., in the Chiricahua Mountains.

SULLIVAN GOLD & COPPER MINING CO.

MONTANA.

Mine office: Kalispell, Flathead Co., Montana.

SULPHIDE COPPER CO.

COLORADO.

Office: care of J. C. Lewis, president, P. O. Box 358, Denver, Colo. Lands, sundry claims, in the Rock Creek district of Gunnison county, Colorado, said to show argentiferous copper sulphide ores. Presumably idle.

SULPHIDE MINING & MILLING CO.

WASHINGTON.

Office: care of Hon. E. C. Trimble, Seattle, Wash. Mine office: Orient, Snohomish Co., Wash. Lands include the Pomeroy mine, on Sulphide Mountain, 10 miles northeast of Orient, in the Colville reserve, opened by sundry open-cuts and a 200' shaft, showing ore giving good assay values in copper, lead, silver and gold.

SUMAS MINING CO.

WASHINGTON.

Mine office: Sumas, Whatcom Co., Wash. W. W. Jones, president; Mrs. M. Record, secretary. Lands, sundry claims, near the head of Swamp Creek, showing auriferous copper ores. Presumably idle.

SUMITOMO COPPER CO.

JAPAN.

Office: Imabashi, Ichome, Osaka, Japan. Mine office: Niihama, Iyo, Shikoku, Japan. Works office: Shisakajina-Ochigun, Iyo, Shikoku, Japan. Employs 4,000 men. Kinkichi Nakada, general manager; Munio Kubo, vice-manager; T. Oba, sub-manager; Tsuruzo Koike, vice-superintendent; Keijiro Nakamura, metallurgical superintendent.

Lands, 5,055 acres, also 410 acres in mill and smelter sites. Property includes the Besshi mine, the second largest copper mine of Japan, a famous old producer, opened A. D. 1670, by the Sumitomo family, in whose capable hands it remains. This mine was making more than 3,000,000 lbs. fine copper yearly, at the close of the Seventeenth Century, and was, at that time, perhaps the largest copper producer in the world.

Ore is cupriferous iron pyrites, carrying small quantities of cobalt and manganese, averaging about 4.5% in copper. The vein varies in width from 4' to 30', with an average of 10' to 20', and has been developed to a length of about 6,000'. The vein occurs in alternating layers of chloritic and graphitic schists, each enveloped by a quartz schist, known locally as "habu," with a dip of 45° N. E., with interstratifications of piedmontite schist. Step-faults, running nearly parallel from east to west, occur among these, giving throws of 10' to 20', and occasionally as much as 60'. The power plant includes water and electric installations, and the mine and

works are being electrified throughout, on a complete and highly modern scale. Electric power will be used for aerial tram-lines, surface trams, traveling cranes, and in the shops, as well as throughout the mine and smelter.

The surface plant at the mine includes machine shops, carpenter shops, smithies, boiler shops and a complete iron foundry, making castings up to 5 tons in weight. The shops are well located, equipped with modern machinery and turn out a great variety, as well as a large quantity, of work.

The company maintains a large fleet of vessels, including 3 steamers and no less than 70 small sailing vessels, of which 20 were added during 1905.

The smelter, located 10 miles from the mine, is of 400 tons daily capacity, with a modern equipment throughout. Barren quartz pebbles are used for flux, no silicious fluxing ore being available, at present.

Production was 8,000,249 lbs. fine copper in 1900, and 13,225,000 lbs. in 1905, showing a gain of more than 50% in 5 years. The property has by no means reached its possible maximum of output, and production is likely to increase steadily. The management of the company is highly progressive, no expense being spared in engaging the best technical talent and securing the best machinery and the latest methods in mining and metallurgy.

SUMMIT MINE.**ARIZONA.**

Owned by Gibson Consolidated Copper Co.

SUMMIT MINING & MILLING CO.**WASHINGTON.**

Office: Davenport, Wash. Mine office: Keller, Ferry Co., Wash. C. H. Neal, president; C. A. Gray, secretary; A. R. Alexander, superintendent. Has a 100' shaft, showing argentiferous and slightly auriferous copper ore, giving assays of about \$60 per ton. Presumably idle.

SUN-ANCHOR MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. L. W. Tennant, president; Geo. Kuntzmann, secretary and treasurer. Capitalization, \$1,000,000. Lands, sundry claims, on Green Mountain. Presumably idle.

C. & J. SUNDHEIM. (SOCIEDAD REGULAR COLECTIVA.)**SPAIN.**

Office: Huelva, Spain. Is an incorporated co-partnership, between Don Carlos Sundheim de la Cueva and Doña Justa Sundheim de la Cueva. William Guthrie Bowie, manager. Property includes the Cabezas del Pasto mines.

SUNDOWN MINE.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Idle.

SUNLIGHT MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Eureka, Colo.

SUN & MOON MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. M. M. Simms, manager, at last accounts. Ores carry gold, silver, lead and copper. Has steam and electric power.

SUNNY CORNER SILVER MINING CO.**AUSTRALIA.**

Is in the Sunny Corner division of New South Wales, Australia. Secures a little copper as a by-product from silver ores, having made 38 tons of copper, from 3,814 tons of ore smelted, 1901. Presumably idle.

SUNNYSIDE COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Riverside, Wyo.

SUNRISE COPPER CO.**WYOMING.**

Mine office: Sunrise, Laramie Co., Wyo. O. L. Vincent, president; H. P. Jarrad, secretary. Organized, September, 1902, under laws of Wyoming. Lands, about 11 miles from Sunrise, were worked originally for iron ore. The copper ores carry gold and silver values. Presumably idle.

SUNSET COPPER CO., LTD.**BRITISH COLUMBIA.**

Dead. Lands, in the Similkameen district, were lost.

SUNSET COPPER MINING CO.**WASHINGTON.**

Office: Colvin Bldg., Glens Falls, N. Y. Mine office: Index, Snobomish Co., Wash. Addison B. Colvin, president; Paris D. Russell, secretary and treasurer; Hon. John C. Denny, chairman executive committee; W. W. Black, general manager; Geo. C. Clark, superintendent. Organized 1897, under laws of Washington, with capitalization \$3,000,000, shares \$1 par. Lands, 35 claims, area 700 acres, including the Sunset group of 23 claims, and Mountain Side group of 7 claims, latter having circa 400' of tunnels, also a 20-acre millsite and sundry water rights. Mine is very fully described in Volume IV, and seems at present under the financial management of W. H. Baldwin, of Glens Falls, N. Y., who sold shares in the swindling California & Nevada Mining Co., and later made restitution by allotting Sunset stock, at par, to parties who bought California & Nevada shares. Early in 1906, Sunset stock was being offered to the public for 75 cents, and to brokers at 25 cents, per share. Management is not favorably regarded.

SUNSET GROUP.**BRITISH COLUMBIA.**

A group of 7 patented claims, area 268 acres, at Brown's Bay, Discovery Passage, Vancouver Island, British Columbia, opened by tunnels of 35', 122', and 256', showing 4 fissure veins, traversing an amygdaloidal diabase, carrying bornite and chalcopyrite, with quartz gangue, giving average assays of 8% copper, 2 oz. silver and \$3 gold per ton. Idle for several years.

SUNSET MINE.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Princeton, Similkameen district, B. C. At last accounts property was under bond to F. T. Underwood, of New York, and was being probed by a diamond drill.

SUPERIOR-ALTA MINING CO.**UTAH.**

Office: care of Walter L. Maas, secretary and manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Alta, Salt Lake Co., Utah. A. J. Jacobson, president; L. A. Jeffs, vice-president. Capitalization \$300,000, shares \$1 par. Idle.

SUPERIOR COPPER CO.**ARIZONA.**

Office: 20 Broad St., New York. Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz. T. B. Mills, president; W. L. Mercer, secretary. Organized under the laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 10 claims, area 200 acres, 26 miles south of Tucson, with a shallow shaft, showing ores said to give average assays of 6% copper and \$5 to \$18 gold per ton.

SUPERIOR COPPER CO.

MICHIGAN.

Office and mine: Houghton, Houghton Co., Mich. Reginald C. Pryor, president; R. Skiff Shelden, vice-president; Courtney C. Douglass, secretary and treasurer; preceding officers, John H. Rice and Jas. P. Edwards, directors; James Biscombe, superintendent. Organized July 23, 1904, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,500,000. The Calumet & Hecla Mining Co. owns several thousand shares of stock in this company, and has enough remaining stock under option to give 51%, or a control of the capitalization, and is in charge of development. The option on the stock expired September 1, 1906, and was extended to December 31, 1906, under condition that the Calumet & Hecla buy certain stock outright, and double the expenditure on development, to circa \$5,000 monthly.

Lands, 400 acres, in Section 15, Town 54 North, Range 34 West. The tract formerly joined diagonally on the northeast corner of the Baltic mine, but owing to a rearrangement between the Baltic and Section 16 mine of the Altantic, the present neighbors of the Superior are the Isle Royale to the north, undeveloped lands to the east and south, and Section 16 of the Atlantic to the west.

The Superior tract carries approximately 6,000' of the strike of the Baltic lode, which has been exposed at three points, by trenches, cut at intervals of about 1,000', the overburden being very light. The trenches show an amygdaloid of circa 40' average width, carrying copper wherever cut, the bed showing extensive carbonate stains, due to weathering, with a little fine copper, near surface, succeeded at depth by heavier copper, as the formation grows more settled.

Development is by 2 shafts, of which No. 1, at the north, is sunk in the footwall, insuring solid ground, but necessitating opening the lode by short crosscuts, at each level. Owing to the great width of the bed, it is necessary to crosscut along the drifts, in order to determine the exact degree of mineralization throughout the lode, but, as a rule, the drifts are carried in approximately the center of the bed, giving a fair average of the values carried. The two upper north drifts in No. 1 shaft show a little copper only, but the south levels all show good ground, and the north drifts on the third and fourth levels make a good showing. The south drift, on the second level, has passed through a copper chute, carrying values equal to the best ground yet opened in the Baltic, or other developed mines on the Baltic lode. The fourth level was opened, in No. 1 shaft, July, 1906.

No. 2 shaft, circa 2,400' south of No. 1, was started June, 1906, and was 100' deep on Aug. 17, 1906. Values in the mine, as opened, are mainly in stamp-rock, with occasional heavy copper, and the rock is somewhat deceptive in appearance, much of what apparently is barren in metal showing good stamp-copper, when broken.

Equipment includes a new steam plant, installed 1906, with a hoist good for 1,500', a 12-drill air-compressor, two 100-h. p. boilers, and a new engine-house and shafthouse. Management is good, and there is little question that the Superior will make a fine mine, of the same general class

as the Baltic, Trimountain and Champion, which are opened to the southward on the same amygdaloidal bed.

SUPERIOR COPPER CO., LTD.

ONTARIO.

Office: Sault Ste Marie, Ont. Mine office: Superior Mine, via Algoma Central Ry., Algoma, Ont. Frank Perry, president; E. L. Fisher, vice-president; W. A. Madison, secretary and superintendent; George Kemp, treasurer; preceding officers, W. L. Martin, H. B. Hanger, J. A. Culbeck, W. H. Teare and Geo. W. Nicholson, directors. Organized September 13, 1901, under laws of Ontario, with capitalization \$1,500,000, increased, 1903, to \$2,000,000, shares \$10 par; issued, \$1,440,000. Lands, 8 crown-granted claims, area 680 acres, in an unorganized district of Algoma, showing 2 fissure veins, in country rocks of granite and green chloritic schists, with average strike of N. 43° W., and dip of 70° to the southwest. First vein averages 20' in width, and second about 70' width, these being traceable about 8,000', with about 1,000' uncovered on the smaller vein, and nearly a mile trenched on the larger vein. Development is by about 20 pits and trenches and by shafts of 100', 154', 100', 40', 100', and 260', with a total of 1,050' of underground openings, estimated to show 500,000 tons of ore, with 134,000 tons blocked out for stoping. Ores are chalcopryrite, bornite and chalcocite, with quartz gangue, carrying estimated average values of 3% copper, 1 oz silver and \$2.50 gold per ton. Has a 120-h. p. steam plant, with 6-drill Ingersoll-Sergeant air-compressor, 5 power drills, 2 hoists, engine-house, smithy, changing-house, boarding-house and 7 dwellings. Considerable good ore has been stocked at the shafts. Idle since August, 1904. Property considered promising.

SUPERIOR COPPER & GOLD MINING CO.

Office: 64 East Second St., Salt Lake City, Utah.

SUPERIOR MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Cerillos, N. M.

SUPERIOR MINING CO.

WASHINGTON.

Office: 1529 Tower Ave., West Superior, Wis. Letter returned unclaimed from former mine office, Berlin, King Co., Wash. J. P. Simon, president and treasurer; B. A. Baerlocher, secretary and superintendent. Organized 1902, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Lands, 4 claims, area 82 acres, in the Miller River district, opened by a 125' tunnel, showing an 8' fissure vein, carrying carbonate and sulphide copper ores, associated with galena, assaying 6% copper, 7 oz. silver and \$1 to \$30 gold per ton. Idle for several years.

SUPERIOR & PITTSBURG MINING CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Chas. Briggs, president; James Hoatson, vice-president; Thos. Hoatson, second vice-president; Louis W. Powell, third vice-president and general manager; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thos. F. Cole, Geo. E. Tener, Chester A. Congdon and Chas. d'Autremont, Jr., directors; H. B. Paull, auditor. Organized circa June, 1906, under laws of Minnesota, with capitalization \$20,000,000, shares \$10 par par; issued,

\$15,000,000, of which \$14,000,000 was allotted to old shareholders of four companies absorbed, and \$1,000,000 was sold for cash, at par, being allotted pro rata to shareholders of the Lake Superior & Pittsburg, Calumet & Pittsburg, Pittsburg & Duluth and Junction mining companies. While at present the Superior & Pittsburg is a securities holding company only, it is planned eventually to retire all stock of the four underlying subsidiary corporations, making the Superior & Pittsburg a direct operating company. The four corporations under control of the Superior & Pittsburg are described fully, under their respective titles.

SURE THING GOLD-COPPER MINING & SMELTING CO. WASHINGTON.

Succeeded, circa 1905, by Clipper Mining Co.

SUSQUEHANNA MINE.

WYOMING.

Owned by Standard Copper Mining Co.

SWAKOPMUNDER MINEN-

GERMAN SOUTHWEST AFRICA.

GESELLSCHAFT.

Office: Schellingstrasse 4, Berlin, W9, Germany. Mine office: Corob, via Swakopmund, German Southwest Africa. Capitalization 36,000 marks. Property is sundry mineral concessions in German Southwest Africa, with several slightly developed prospects, showing copper. Idle.

SWANSEA MINING CO.

MEXICO.

Property, at La Cananea, Sonora, Mexico, sold, September, 1905, to Ronquillo Copper Co.

SWEDEN COPPER CO.

WASHINGTON.

Merged, circa 1903, in Mt. St. Helens Consolidated Mining Co.

SWINDLER MINE.

ARIZONA.

Owned by Huron Gold Co.

SWISHELM DEVELOPMENT CO.

ARIZONA.

Lands, 40 claims, in the Swishelm Mountains, Cochise county, Arizona. Idle.

SWISS GIRL MINING CO.

ARIZONA.

Lands sold, circa 1901, to Baumann Copper Co.

SYLVANIA MINE.

NEVADA.

Mine office: Bullion, Elko Co., Nev. Vein carries a 6' paystreak, from which circa 1,000 tons have been shipped. Presumably idle.

SYNDICATE MINING, MILLING & SMELTING CO.

Office: Spokane, Wash. Lands, 3 claims, 1 mile from the Snake river, said to show an 18' contact vein between limestone and granite, carrying bornite and chalcopryrite assaying 12% to 17% copper, with small gold and silver values, opened by a 55' tunnel and sundry surface-cuts.

TABLAS-FINANA COPPER CO., LTD.

SPAIN.

Voluntarily wound up, December, 1901.

TABLE MOUNTAIN COPPER CO.

ARIZONA.

Letter returned unclaimed from former mine office, Kelvin, Pinal Co., Ariz. Is controlled by Arimex Consolidated Copper Co., through ownership of 85% of stock issue. Lands, 27 claims, in the Bunker Hill district. Property not regarded as especially promising.

TACOMA COMPANY.**BRITISH COLUMBIA & WASHINGTON.**

Office: Tacoma, Wash. Mine offices: Van Anda, Texada Island, B. C., and Darrington, Snohomish Co., Wash. Employs 60 men. A. Grant, general manager.

Lands include a gold-copper mine, at Darrington, Washington, which was idle at last accounts, also 640 acres, crown-granted, carrying gold and iron ore, on Texada Island, 208 acres of iron ore lands on Redonda Island, British Columbia, 4,000 acres of lands carrying coking coal in Washington, and the Marble Bay mine.

The Marble Bay mine, about $\frac{1}{4}$ mile from the Cornell and Copper Queen mines, has similar occurrence and character of ores, which are slightly auriferous and argentiferous bornite and chalcopyrite, averaging circa 5% copper, 2 oz. silver and \$1 gold per ton, values occurring mainly in chutes, which are large and rich. The mine is developed by several shafts, deepest 360', and by tunnels, with a winze 100' below the 550' level, equipped with a hoist. The property has a 150-ton concentrator, connected by a 2,125' aerial tram with ore-bunkers on Sturt Bay, but the mill is idle, ore being hand-sorted, on sorting tables, for shipment. Equipment includes a steam and electric plant, and a lime-kiln, with 2 stacks, of 150 bbls. daily capacity. Production of ore was 6,370 tons in 1902, 13,429 tons in 1904 and circa 12,000 tons in 1905.

TACOMA SMELTING CO.**WASHINGTON.**

Office and works: Tacoma, Pierce Co., Wash. Employs 675 men. W. R. Rust, president and treasurer; Edward Brush, vice-president; D. D. Craig, secretary; L. J. W. Jones, general superintendent; preceding officers, F. W. Clark and E. B. Braden, directors; T. R. Wilkinson, refinery superintendent; Roger Taylor, assistant superintendent copper smelter; R. F. McElveney, assistant superintendent lead smelter. Organized 1898, under laws of Washington, with capitalization \$500,000, shares \$1 par. Is controlled, through stock ownership, by the American Smelters Securities Co. Employs 200 men in the copper works, 250 men in the lead works and 225 men in the copper refinery. Paid quarterly dividends of 2 $\frac{1}{4}$ % in 1903, and is said to have a cash working capital of about \$300,000, in addition to a plant costing about \$400,000.

Lands include an extensive and well-located site, on tidal water, flats being reclaimed by filling in with slag. Improvements include extensive wharves, with ore-bunkers and automatic devices for unloading cargoes, a small electric tram-line connecting the wharves with all parts of the works. The smelting plant includes four 100-ton blast-furnaces, with 3 Connersville blowers, driven by a 200-h. p. Westinghouse induction motor, for lead smelting. The copper smelter includes three 60-ton mechanical roasters and two 10-ton hand-roasters, in addition to which ores are heap-roasted. The copper stack is a 400-ton water-jacket blast-furnace, 42x160" at the tuyeres, with forehearth 14' in diameter and 4' high, holding 60 tons of molten matte. A 36" cupola resmelting furnace, with outside settler, can treat 75 tons of 50% matte daily. The converter department has 2 stands, with 6 barrel-type shells of 72x100", and 30-ton electric crane. Management is progressive

and the metallurgical practice is good, this being one of the most important custom smelters on the Pacific coast, with a rapidly growing business.

TADERGOUNT COPPER MINE.**ALGERIA.**

An Algerian property, location uncertain, but possibly Tadgemount, on the headwaters of the Jedi river, Amour Mountains, which shipped 200 tons of copper ore in 1901.

TAKILMA SMELTING CO.**OREGON.**

Office: P. O. Box 1487, Colorado Springs, Colo. Works office: Takilma, Josephine Co., Oregon. Employs 50 to 75 men. Chas. L. Tutt, president; K. R. Babbitt, vice-president; J. A. Hull, secretary and treasurer; E. W. Walter, general manager; C. J. Murphy, superintendent. Organized under laws of Colorado with capitalization \$250,000, shares \$10 par.

Lands, 175 acres, 160 acres patented, also a 160-acre smeltersite, giving total holdings of 335 acres, in the Waldo district, including the Queen of Bronze and Cowboy mines. Country rocks are diorite and serpentine, showing several veins with north and south strike, of which 3 are more or less developed, by a shaft of 150' and by tunnels of 200', 640' and 150', with several thousand feet of workings, showing circa 20,000 tons of oxide and sulphide ore, giving average assays of 8% copper and \$2.50 gold per ton.

The smelter, at Takilma, receives ore by wagon and tram. The plant has a 150-ton water-jacket blast-furnace, making matte averaging 45% copper, 2.5 oz. silver and \$2.50 gold per ton, which is shipped to the Tacoma Smelting Co., for refining. Miscellaneous improvements include a sawmill.

The smelter is idle, during the fall and winter rain, owing to impassable roads. Nearest railroad point is Grants Pass, 42 miles distant, and during the shipping season, 60 teams are required to haul out matte and haul in coke and supplies. Company is said to plan building a railroad to the mines of the Waldo Smelting & Refining Co., which is under practically the same management, and this road may be extended, eventually, to Grants Pass. Production, 1905, was 7,543 tons of ore, giving 1,563 tons of matte of about 45% copper tenor, indicating average returns of 8% copper, from the ore smelted. The company is said to plan doubling the capacity of the smelter. Management is excellent, being composed of men experienced and successful in mining and smelting.

TAMARACK JUNIOR MINE.**MICHIGAN.**

Owned by Osceola Consolidated Mining Co. Idle since 1902.

TAMARACK MINING CO.**MICHIGAN.**

Office: 303-199 Washington St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Albert S. Bigelow, president; Norman W. Haire, vice-president and general manager; Wm. J. Ladd, secretary and treasurer; preceding officers, Jos. S. Bigelow, David M. Anthony, Edw. S. Grew and J. Henry Brooks, directors; Wm. J. Uren, general superintendent; John T. Been, assistant superintendent; Thos. Maslin, chief mining captain; John T. Reeder, general clerk and purchasing agent; Wm. Harris, chief clerk; Chas. D. Hohl, engineer; A. Lincoln Burgan, mill superintendent; H. B. Claussen, superintendent motive power.

Organized 1882, under laws of Michigan, with capitalization \$1,500,000, shares \$25 par. Began dividends 1888, and paid 39 dividends, aggregating \$8,700,000, to end of 1905, and paid a \$3 dividend Jan. 25, 1906. Annual meeting, first Thursday in May.

Official returns to the State of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$ 580,000.00
Amount paid in by conveyance of property.....	200,000.00
Entire amount invested in real estate.....	199,486.00
Amount of personal estate.....	1,892,511.06
Amount of floating debt.....	1,076,628.93

The following table gives comparative results for three calendar years:

	1903.	1904.	1905.
Tons rock stamped	657,920	642,320	750,120
Pounds mineral obtained	24,055,512	22,662,070	24,780,945
Pounds fine copper obtained	15,286,093	14,961,885	15,824,008
Pounds fine copper per ton stamped	23.2	23.3	21.1
Cost of mining and stamping, per ton	\$ 2.32	\$ 2.42	\$ 2.39
Cost of stamping, per ton, cents..	.2624	.2603	.2217
Cost per pound fine copper, cents..	.1150	.1298	.1337

Lands, 1,120 acres, in Sections 10, 11, 14 and 15, Town 56 North, Range 33 West, also the Cliff mine, in Keweenaw county, a millsite on Torch Lake, and miscellaneous timber lands and other realty, giving total landed holdings of 8,640 acres. The Tamarack mine proper is opened on a tract of very irregular outline, bounded on all sides by lands of the Calumet & Hecla. The Tamarack is opened on the underlays of the Calumet conglomerate and Osceola amygdaloid beds. The mine was planned by the late Capt. John Daniell, who conceived the idea of opening the underlay of the conglomerate by a deep vertical shaft. Actual work of sinking No. 1 shaft was begun in 1882, and the conglomerate was cut in 1885, three and a half years later, at a depth only 10' greater than the estimate of Capt. Daniell, made before the first sod was removed.

The mine is opened by five shafts. The South Tamarack includes shafts Nos. 1 and 2, the original openings, while Nos. 3 and 4 are known as the North Tamarack, and No. 5, the newest shaft, is about midway between the north and south workings.

No. 1 shaft, 3,409' deep at the end of 1905, cuts the conglomerate at 2,270', and also cuts the Osceola amygdaloid. In this shaft as in all others of the Tamarack, the various levels are reached by crosscuts from the shaft, except at the actual point of intersection, this applying to both the conglomerate and amygdaloid beds. The normal productive capacity of No. 1 shaft is 400 tons daily, and the amygdaloid workings are showing an improvement. The shaft is considerably drawn, and needs retimbering. No. 1 has a powerful hoist, good for the life of the shaft.

No. 2 shaft, near No. 1, is 4,355' deep. In deep vertical shafts an absolutely perpendicular line cannot be maintained permanently, where the superimposed strata incline at any considerable angle, as in the case of the Tamarack. Slipping that cannot be detected on surface will work havoc with the perpendicularity of a deep shaft, in the course of years. No. 2 shaft became so badly drawn, early in 1904, that cages could not be operated, and was rebuilt from top to bottom. It being manifestly impossible to make any shaft immune from drawing because of earth movements, a double-lined shaft was constructed. This has an outer and an inner lining, the inner braced against the outer with timbers of varying length. These braces can be shortened or replaced, from time to time, and No. 2 shaft, was built to last the lifetime of the mine, but the best laid plans of mice and men gang aft agley, and a mine fire that broke out in No. 2 shaft, early in January, 1906, greatly damaged the new timbering, as well as causing many months' idleness and a heavy loss in production. No. 2 has a powerful hoist, good for the depth to which it can be sunk on the Tamarack lands.

No. 3 shaft is nearly a mile north of No. 1, and was 5,139' deep at the end of 1905, being the deepest on the globe, cutting the Calumet conglomerate at a vertical depth of 4,185'. The bed is 20' to 25' wide, but is irregular in values, and far from rich, though payable, normal production being about 1,000 tons daily. The surface equipment includes an Allis hoist, with double conical drum, of 13' 6" diameter at either end and 36' 9" diameter in the center. The cable winds over specially built-up runs of steel, affixed to the surface of the drum, which works in counterbalance. This hoist has raised a 10-ton load, vertically, at a speed of 55 miles per hour, and running at that rate the cage has been stopped in a distance of 75'. The shaft has a 60-h. p. fan, 10' in diameter, with blades 3' 6" wide, capable of supplying 192,000 cubic feet of free air per minute, to the depth of the shaft, which not only ventilates the mine but also aids in reducing the temperature, which otherwise would be nearly 90° Fahrenheit, in the bottom levels. An auxiliary hoist, used for lowering and raising men and timber, is a Nordberg duplex, with 32x72" cylinders, having a drum of 18' 6" diameter, with lathe-turned grooves for coiling the cable.

No. 4 shaft, 600' northeast of No. 3, is 4,450' in depth, and has not been deepened since bottomed, in 1895. Occasional good ground is opened, but the shaft as whole is poor. Underground connection is had with No. 3, giving ventilation, and safety to miners in case of accident. No. 4 is used exclusively for hoisting water, lowering and raising men, and for purposes of ventilation and safety. A new concrete lining was substituted for the old wooden timbering, through the overburden, in 1904.

No. 5 shaft, lying about 3,300' southwest of No. 4, and about midway between the Old Tamarack and North Tamarack shafts, is the newest and largest shaft of the mine, and but little shallower than No. 3, being 5,086' deep at the end of 1905. Sinking was begun Aug. 7, 1895, and the conglomerate was cut on Dec. 20, 1901, at a vertical depth of 4,662', the late Capt. Wm. E. Parnall having foretold the depth within 12', and the time required within 11 days,

when the work was begun, 6 years before. The shaft is 7x29', inside measurement, with 5 compartments in a row. The three central compartments, 5'x7' 2" each, are used for cages. One of the end compartments, also used for a cage, is 7' 2"x5' 4", the extra 4" being allowed for timber strain, while on the other side of the shaft is a compartment 3'x7' 2" for ladders, pipes and wires. The 10x14" wall-plates of this shaft are 29' 2" long and the 5x7" runners, serving as guides for the cages, are 16' to 22' in length. Instead of lag-screws being countersunk, the runners have a central groove, 2" wide and 1½" deep, running from top to bottom on both sides of each of the four hoisting compartments, these grooves providing for the escape of loosened lag-screws, without damage to cages or runners. The shaft openings have automatic covers that lift for passage of the cages. In sinking this shaft, 83 separate strata of trap, amygdaloid and conglomerate rocks, all barren, were cut, before the Calumet conglomerate was reached. Drifts have been opened both north and south, on the 31st to 38th levels inclusive, the northern drifts showing poor ground, with some improvement to the south. The north drifts on the 35th, 36th and 37th levels have been carried to the Calumet & Hecla boundary. As a whole No. 5 shaft is decidedly low in grade, although the conglomerate is of good average width. Connection has been secured underground with Nos. 1 and 2 shafts, and will be secured, eventually, with Nos. 3 and 4.

Surface equipment at No. 5 is the most extensive found at any shaft of the mine. The engine-house, boiler-house and compressor buildings are of redstone, with steel truss roofs. The engine-house has two duplicate 6,500-h. p. Nordberg hoists, each with four 36" high-pressure cylinders having 72" stroke. The drums are 24' in diameter in the center, tapering to 16' at the ends, each half carrying 6,500' of 1½" steel cable, the hoists operating in counterbalance and being capable of raising from a depth of 6,000' a net load of 6 tons of rock, this having a gross weight, with cage and cable, of about 12 tons. The hoists cost \$60,000 and \$90,000 respectively. The boiler-house has six 200-h. p. Burt boilers with 81" shells, and two 115' brick-lined self-supporting steel smokestacks. Coal is delivered to the boiler-room from a railroad trestle.

The 50x75' redstone compressor building at No. 5 has a 35-drill Ingersoll-Sergeant two-stage cross-compound air-compressor, with 18" and 34" steam cylinders and 36" stroke, and a 100-drill triple-expansion Nordberg compressor with 19x53x48" steam cylinders, and two-stage air cylinders of 18x27x48".

The shafthouse and rockhouse at No. 5, built by the Wisconsin Bridge & Iron Co., at a cost of nearly \$100,000, are on separate foundations and are separately framed and braced, although apparently standing as one building. 56x120' on the ground, with an extreme height of 131'. The foundations are exceptionally massive, and the girders and framing are of unusual strength, to withstand the great strains caused by hoisting heavy cages, and the operation of powerful rock-breaking machinery. These buildings required about 700 tons of steel and 100 tons of corrugated iron siding in construction. Although 10 carloads of lumber were used in the building, no wood is exposed, except in the floors, asbestos sheathing-paper being used elsewhere to protect the wood, thus rendering the building practically fireproof. The rockhouse

has 3 Portage Lake crushers of the reciprocating jaw type, with room for 5 more when needed. Miscellaneous buildings at No. 5 shaft include a stone dry and smithy. An extensive timber yard was completed at No. 5, in 1905, on ground filled and graded for the purpose, the site having been a swamp, originally.

Water for steaming purposes and domestic use is pumped from Lake Superior, against a head of nearly 700'. The pumping station, nearly 5 miles northwest of the mine, has a Nordberg duplex pump, capable of raising nearly 1,500,000 gallons daily. Water is taken from a 40' well on the lake-shore, connected with a tunnel driven 480' under the bed of the lake, with about 35' of water above the intake. Water is delivered into two steel tanks, of 42' and 65' diameter, on the highest point of the Tamarack mine location, these having a combined storage capacity of 200,000 gallons, water being distributed into mains from these standpipes. The pumping plant has developed remarkable efficiency, cost of operation being only about \$10 per diem, including fuel and wages.

The Tamarack mine location is extensive, with a large number of dwellings for employees. The company owns and operates a hospital, 60x60' in size, with two full stories, basement and attic. The basement and first floor are of selected Lake Superior redstone, upper story and attic of frame, with interior finish of selected quarter-sawed Georgia pine. The building has emergency wards, operating room, dispensary, sun-veranda, elevators and indirect steam heating.

The Tamarack owns the old Cliff mine, in Keweenaw county, the oldest mine in the Lake Superior district, which paid dividends of \$2,518,620 from 1849 to 1879, inclusive. The mine was opened on a fissure vein, which was worked out, and the property abandoned in 1878. Diamond drilling was done on this tract during 1903, 1904 and 1905, the cores locating two cupriferous amygdaloids, one of which is supposed to be the northern extension of the Kearsarge lode, but apparently nothing of marked promise has been found by the drills, as yet. The old waste-burrows, which are extensive, have been leased, on royalty, to Henry Warren, who is building a mill with 8 gravity stamps, to treat the tailings.

The Tamarack has two stamp-mills, located on Torch Lake, a little more than a mile south of the Calumet & Hecla mills. The mills have 7 stamps, with an aggregate daily capacity of 3,200 tons of conglomerate rock. The heads have been fitted with eight-inch motor-grates, opening into quarter-inch-mesh revolving screens having Parnall-Krause hydraulic discharges. Finisher jigs have been replaced by Wilfley tables and Nordberg crushing rolls were installed, 1904, to care for the raggings from the stamp-mortars. These rolls have rigid journals, and each set has an independent wash.

No. 1 mill has Allis heads. Three of the 5 heads have been compounded, 2 single-stage heads being held in reserve. In the boiler-house at No. 1 mill four old boilers have been replaced by four 200-h. p. Pratt boilers, built for 200 lbs. steam pressure, but operated at a pressure of 150 lbs. per sq. inch.

No. 2 mill has two steeple-compound Allis-Chalmers stamps, and a 40' addition has been built to the mill to provide the extra wash-room required by the increased stamping capacity of the heads. The 5 compounded heads are equal in capacity to the 7 single-stage heads formerly used, and are equal, at present, to treating the full normal production of the mine. No. 2 mill has a traveling crane, and No. 2 boiler-house has seven 200-h. p. boilers.

The Tamarack and Osceola mills have a joint pump-house, equipped with one 15,000,000-gallon pump and two pumps of 40,000,000 gallons daily capacity each, giving a total pumping capacity of 95,000,000 gallons per diem, practically 4,000,000 gallons per hour. The second large pump went into commission July 5, 1906.

Miscellaneous improvements at the millsite include a considerable number of dwellings for employes, and various subsidiary shops. A new machine-shop, of sand-lime brick, with steel roof, is 30x90' in size, and finely equipped.

The joint wharves and steel coal-sheds of the Tamarack and Osceola, at Dollar Bay, on Portage Lake, are among the most extensive in the Lake Superior district.

Smelting is done at Dollar Bay, in the works of Lake Superior Smelting Co., controlled by the Tamarack, Osceola and Isle Royale companies, which have the same general management. All mineral is taken from mills to furnaces in hopper-cars, saving the former cost of barreling.

The Tamarack always has been an expensive mine to work, and the costs have increased of late years, unavoidably. Deeper openings mean greater costs in opening the ground, longer trams through crosscuts, heavier hoisting and pumping charges and increased danger in operation. Last, but by no means least, deeper workings mean lessened copper values. The management is devoting much thought and effort to the property, and in good years the Tamarack should earn substantial profits. Unfortunately the 1906 production will be much lessened, and profits greatly reduced, by the serious fire in No. 2 shaft, which cost a half-year's production from the South Tamarack, the richest part of the mine, and which will cut the year's output of metal to the lowest figures known for many years.

MINA TAMAYA.

CHILE.

An idle mine, once important, 65 miles from Coquimbo, Chile.

TAM O'SHANTER MINE.

NEVADA.

Mine office: Sandy, Lincoln Co., Nev. J. R. Newberry, owner. Idle. **TANGANYIKA CONCESSIONS, LTD. RHODESIA & CONGO FREE STATE.**

Offices: 31, Clements Lane, London, E. C., Eng. Tyndale White, chairman; Robt. Williams, managing director; Geo. Grey, manager in Africa; R. M. Irwin, mine manager; C. R. Adams, resident engineer and mine superintendent; John R. Farrell, consulting engineer; L. Scotland, secretary. Organized Jan. 20, 1899, with capitalization £525,000, shares £1 par; issued £362,580. Company has bonds and shares in the Benguela and Katanga railway companies, owning 40% of the £40,000 capitalization of the Katanga Railway Co.

Lands, 2,000 square miles, north of the Kafue and Zambesi rivers, in the Katanga district, Rhodesia, near the Congo Free State boundary, also 2,000 acres for railroad and steamship terminals, at the southern end of Lake Tanganyika, and a concession to explore extensive areas in the Congo Free State for 5 years, ended Dec. 31, 1905, and to work any discovered mine for 30 years, with option of extending period of working to 99 years. In the Congo Free State 72 large mining concessions have been located, and company estimates that 5 of these claims show 15,000,000 long tons of 10% copper ore, most of which can be won by quarrying, and on another group company estimates 1,500,000 tons of 13% copper ore. The Congo properties, in the Katanga district, are in a rolling country, with a healthy climate.

The principal copper mines of the company, in various stages of development, are the Kansanshi, Kambobe, Kabalela, Kakanda, Likasye and Fungurume. Principal developments are on the Kansanshi, said to have a 16' fissure vein, with north and south strike, which has been worked open-cast, by natives, for centuries, the mine showing trenches and pits for a distance of about 6,000', these varying in width from 1' to 75' and in length from a few feet to 1,200', with extreme depth of 50' in the deepest pit. Country rock is sandstone, in places micaceous and fissile, and in other soft and clayey, through partial decomposition, the sandstone being more or less charged with malachite, occurring as speiss. In the upper portions the vein matter carries malachite and chrysocolla, with occasional occurrences of azurite and melaconite, but in the deeper portions has chalcocite and chalcopyrite, associated with iron pyrites, and carries occasional cuprite, the gangue being silicious, with considerable manganese dioxide in the superficial portions. The ferruginous matter in the gangue is chiefly limonite, usually somewhat ochrous, but occasionally hard and compact. The outcrops are mainly malachite, and are stated by Mr. Farrell to show no evidence of having resulted from alteration of sulphides in place, the evidence leading Mr. Farrell to the opinion that the malachite was deposited from hot solutions, coursing in fissures. Five shafts have been sunk in old trenches, showing veins of 1' to 16' width, and ore is stated by Mr. Farrell to average 15% copper, at a depth of 100', mainly from malachite, with traces of sulphides. Ore carries an excess of about 35% silica, and will require heavy fluxing, for which purpose iron ore and limestone in abundance are not far distant.

The Fungurume mine has 4 short tunnels, one of which is stated to have penetrated 191' of ore. The Likasye also is being opened by a tunnel. Principal developments, outside of the Kansanshi, are at the Kambobe No. 2, which has two shafts, H and I, about 100' deep each, with crosscuts said to expose an ore body of nearly 300' width.

The Ruwe gold mine shows an ore body of 9' to 14' width, opened for a quarter mile by 7 shallow shafts, deepest apparently being circa 100' only. The vein apparently is a sandstone reef, likely to prove of considerable permanence, and carries gold up to 9 oz. 7 dwts. per long ton. The ore is said to average 5 dwts. gold and 9 dwts. platinum, with occasional palladium, the

gold being quite coarse. At the Ruwe is an alluvial gold deposit, estimated to contain circa 20,000 oz. gold, from which an average monthly production of £1,500 is secured, at a cost of only about 12s. per ounce.

The company also has stream-tin deposits, at Busanga, the payable alluvium ranging from 3' to 10' in thickness. Lode-tin deposits have been found at Kasonso and Chienzi.

The company owns and operates stores, and has a railway concession from the Portuguese government for construction of a line from Lobito Bay to Lake Tanganyika, which will require an expenditure of about £4,000,000. The climate near Tanganyika is said to be very good, for equatorial Africa, with an abundance of wood, and good water. The company has immense holdings, in districts difficult of access, and the work done has been distributed over such a large area that no great amount of development has been secured at any one point. Rail connections are absolutely necessary, for the making of payable mines of any considerable size, though the Ruwe placer mine is a highly profitable property, on a small scale. Some of the company's copper properties are decidedly promising.

TARBOX MINE.

MONTANA.

Mine office: Saltese, Missoula Co., Mont. Is opened to depth of 500', and has produced some ore of fair grade, from a 30' vein, having a 12' pay-streak of milling ore, balance being white quartz, carrying a little galena.

TARTANA, LTD.

AUSTRALIA.

Offices: London Bank Chambers, Creek St., Brisbane, Queensland, Australia. Mine office: Chillagoe, Queensland, Australia. H. M. Hicks, chairman; G. S. Murphy, auditor; King & Rutledge, solicitors; J. B. Charlton, broker; E. Austin Bell, secretary. Organized under laws of Queensland, with capitalization £120,000, shares 5s. par. Lands, 230 acres, leasehold, on the Walsh river, circa 30 miles northwest of Chillagoe, showing large deposits of auriferous and argentiferous oxidized ores, below which considerable bodies of sulphides should be found. Has sent a little hand-picked ore, averaging 15% copper, to the Chillagoe smelter.

TASMAN-COMSTOCK CONSOLIDATED.

TASMANIA.

Mine office: Queenstown, Montagu Co., Tasmania. A. Morley, manager. Lands, sundry claims, on the western slope of Mt. Lyell, slightly prospected. Employed 2 men, at last accounts, June, 1905.

TASMAN & CROWN LYELL EXTENDED MINING CORPORATION. (NO LIABILITY).

TASMANIA.

Office: 47 Queen St., Melbourne, Australia. Mine office: North Mount Lyell, Montagu Co., Tasmania. Employs 10 men. Tom Agg Hills, chairman; preceding officer, Thos. White, A. F. Dean, W. F. Coleman and M. J. Jones, directors; John Branden, secretary; Edward Holehan, mine superintendent. Reorganized April 24, 1906, under laws of Victoria, with capitalization £37,500 shares 5s. par, of which 50,000 shares were issued to vendors and 100,000 shares were subscribed, 6d. paid in, giving a cash working capital of £1,500.

Lands, 3 claims, area 181 acres, in the North Mount Lyell district, developed by tunnels of 400' and 1,453', showing 2 ore bodies, carrying sulphide

ores of copper and lead, giving average assays of 7% copper and 15% lead. Company plans continuing development, on a small scale.

TASMANIA COPPER MINING & MILLING CO.

COLORADO.

Office: 603 Provident Bldg., Philadelphia, Pa. Mine office: Winfield, Chaffee Co., Colo. D. B. Dance, vice-president; G. Albert Smyth, secretary; Edw. O. McHenry, treasurer. Organized April 20, 1898, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par. Lands, 13 claims, area circa 250 acres, in the La Plata district, with about one half mile of underground openings, estimated to show 750,000 tons of auriferous and argentiferous galena, sphalerite and chalcopyrite. Has a pyritic smelter, of 20 to 40 tons daily capacity.

TASMANIAN COPPER CO., LTD.

TASMANIA & AUSTRALIA.

Offices: 348, Winchester House, London, E. C., Eng., and Patterson St., Launceston, Tasmania. Mine offices: Rosebery, Montagu Co., Tasmania, and Blinman, South Australia. F. L. Cox, chairman; E. M. King, chairman local board; C. M. Henrie, general manager; J. G. Coldwells, secretary London office; A. Simon, secretary Tasmanian office. Organized Jan. 13, 1897, with capitalization £325,000, shares £1 par; issued, £317,069. Debentures, £12,500, at 10%, issued June, 1905, redeemable, 1915, at par, or earlier at 50% premium.

Tasmanian property includes the Rosebery and Ring River mines, area 386 acres, also a 5-acre smelter-site, in the West Coast district, showing a 24' fissure vein, traceable about 3,000', carrying 1% to 3% copper, 10 oz. silver and 3 dwts. gold per ton. Ore is zinciferous chalcopyrite, and owing to excess of zinc, at depth, no satisfactory method of reduction has been devised. Mine is developed by tunnels, longest 644', with about 1,600' of underground openings, and ore reserves are estimated by company at 158,400 tons.

The Blinman mine, in the Flinders Range of South Australia, 272 miles north of Adelaide, was bought 1902, and is proving somewhat uneven in values. The Blinman, opened 1862, reopened circa 1899, has a 450' main shaft, and has produced considerable ore averaging 8% in copper tenor, as mined, concentrated to an average tenor of 23% copper, for shipment to smelters, in addition to which small quantities of hand-picked ores, of 30% to 40% tenor, have been shipped. District is arid and considerable trouble is experienced in the dry season, from inadequate water supply. Ore reserves at the Blinman, June, 1904, were estimated at 58,500 tons, with circa 20,000 tons of medium-grade ore on surface. Production, 1904, from 3 months operations, was 288 long tons of matte, of 52.25% copper tenor, made from 5,524 long tons of ore smelted, equal to 337,075 lbs. fine copper. The Rosebery is a small producer, and, at last accounts, the Blinman was under development.

TASMAN LYELL COPPER CO., LTD.

TASMANIA.

Absorbed, March, 1903, by Lyell-Comstock Consolidated Copper Co., Ltd.

TATERI MINE.

JAPAN.

Mine office: Nosakogawa-mura, Yoshino-gori, Yamato, Japan. A very small producer, making circa 40,000 lbs. fine copper yearly, at last accounts.

TAUNTON-NEW BEDFORD COPPER CO.**MASSACHUSETTS.**

Office and works: New Bedford, Mass. Henry M. Lovering, president; Clarence A. Cook, vice-president and agent; Henry F. Bassett, treasurer. Is a consolidation of the Taunton Mfg. Co., New Bedford Copper Co. and Revere Copper Co. Has extensive copper and brass rolling mills.

TAYLOR COPPER MINES CO., LTD.**ONTARIO.**

Office: care of Robt. H. Taylor, president, Sault Ste Marie, Mich. H. P. Taylor, secretary. Expended about \$30,000 in exploratory work. Idle since circa 1903.

TECOLOTE COPPER CO.**NEW MEXICO.**

Mine office: Las Vegas, San Miguel Co., N. M. Has steam power and a concentrator. Idle at last accounts.

TECUMSEH COPPER CO.**MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Boston, Houghton Co., Mich. John C. Watson, president; Daniel L. Demmon, secretary and treasurer; Richard M. Edwards, superintendent; preceding officers, Frank N. Stackpole and Stephen R. Dow, directors. Organized circa 1880, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,498,975. Ended 1905 with cash on hand, \$32,181.

Lands, 560 acres, in a very irregular tract, lying next south of the Osceola mine, carrying circa 400 acres of the underlay of the Kearsarge lode. The property has had considerable development, at different times, in the past. First work was done on the Calumet conglomerate, where a shaft was sunk circa 1,000', but found no payable copper. The second era of activity, 1899-1902, included the sinking of a shaft of about 2,300', on the Osceola amygdaloid, but this bed was found practically barren of copper, and work was abandoned November, 1902.

Work was begun May, 1905, to locate the Kearsarge lode, which was showing well a short distance to the northward. Diamond drill borings located the Kearsarge bed, and it was decided to sink 2 shafts thereon. Owing to the narrowness of the tract, the Tecumseh carrying circa 1,800' only of the strike of the Kearsarge lode, shafts are located 1,000' apart, and can be sunk to a depth of circa 4,000' each, before reaching the boundary, being sunk diagonally on the plane of the lode. No. 1 shaft was cutting a plat for the 400' level, in May, 1906. The lode, as opened, averages about 15' width, and gives a promising showing of copper. Plats have been cut and 10' drifts started, each way, on 4 levels. No. 1 shaft is 6x18', with a hoist good for 1,000', and will sink to considerable depth before drifting. No. 2 shaft, 1,000' north of No. 1, was started August 30, 1905, and was about 50' deep in May, 1906.

The showing made by the Tecumseh, on the Kearsarge lode, is decidedly promising, but additional lands are needed to make a mine of good size, and there should be a consolidation of the holdings of the Tecumseh and adjoining land-owners.

TEHAMA MINING CO.**CALIFORNIA.**

Office: care of C. J. Gooch, president, Red Bluff, Cal. Property is the Donkey mine, supposedly a continuation of the Afterthought mine of the

Great Western Gold Co., in Shasta county, California. Is said to show a considerable body of medium-grade ore. Idle for several years.

TELEPHONE-ANCHOR MINE.**WYOMING.**

Letter returned unclaimed from former mine office, Rambler, Wyo.

TELESFORO COPPER CO., LTD.**SPAIN.**

Offices: 70, Queen Victoria St., London, E. C., Eng. Mine office: Cortegana, Huelva, Spain. Vicomte de la Jaille, chairman; T. Greenhill, secretary. Organized March 9, 1904, with capitalization £50,000, shares £1 par; issued, £9,207. Lands are El Telesforo and La Segura mines, near Cortegana.

TELLER MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, manager, at last accounts. Ores carry gold, silver, lead and copper.

TEMPEST MINING & SMELTING CO.**OREGON.**

Letter returned unclaimed from former mine office, Alamo, Umatilla Co., Ore. Ores carry gold, silver and copper. Has electric power and a 20-ton smelter.

FUNDICIÓN TEMPLEMAN, LTD.**CHILE.**

Voluntarily liquidated, July, 1902.

TENDERFOOT MINING CO.**WYOMING.**

Mine office: Douglas, Converse Co., Wyo. W. F. Hamilton, president; B. J. Erwin, secretary and treasurer. Lands, 6 claims, having a 90' shaft, showing ore averaging 4.5% copper. Has a 700' steam hoist. Idle.

TENNESSEE COPPER CO.**TENNESSEE.**

Office: 11 Broadway, New York. Mine office: Copperhill, Polk Co., Tenn. Employs 1,000 men. J. Parke Channing, president; Frederick Lewisohn, vice-president; J. H. Susmann, treasurer; preceding officers constitute the executive committee; E. C. Westervelt, secretary; preceding officers, H. H. Rogers, A. C. Burrage, Walter Lewisohn, Phillip L. Henry, Jas. Phillips, Jr., directors; Randolph Adams, general manager; B. B. Gottsberger, assistant manager; W. L. Stevens, smelter superintendent; John Edwards, mine superintendent. Organized Apr. 26, 1899, under laws of New Jersey, with capitalization, \$5,000,000, shares \$25 par. Debentures, outstanding, \$450,000, in \$1,000, 20-year 5% bonds. Paid 5% dividends 1903, 1904 and 1905. Issued 25,000 shares of treasury stock, at par, for new equipment, in 1905, and ended the year with cash, accounts receivable and bills receivable, aggregating \$729,472.43. Net profits for 1905 were \$452,106.07. Annual meeting, last Thursday in February. Colonial Trust Co., New York, and State Street Trust Co., Boston, registrars; National City Bank, New York, and Old Colony Trust Co., Boston, transfer agents. Stock is listed on the Boston Stock Exchange and dealt in on the New York curb market.

Lands, 2,080 acres, also 11,000 acres miscellaneous lands, in the Ducktown district, showing 6 series of lenses, of which 3 are being developed. Ore occurs as lenses in fissure veins, lenses averaging 30' to 70' width and 500' to 2,000' length, with an average depth of 400'. Ore is chalcopyrite, associated with iron pyrites, in a quartz gangue, carrying 2% to 4% copper, about 40% iron, 27% sulphur and 15% silica, with only traces of gold

and silver. Country rock is metamorphic mica-schist, of pre-Cambrian age, ore bodies showing extensive gossan cappings, and originally having a little oxidized ore near surface, which was mined out, long ago. As zinc and other refractory elements are lacking, the ore is excellently adapted to cheap and close concentration, and also smelts well, giving very clean slags.

Mines of the company include the Burra Burra, London, Tennessee, and Polk County, developed to depths of 300' to 605'. These mines were opened circa 1850, and were operated regularly, previous to the American Civil War. The principal property is the Burra Burra, having a 605' main shaft, sunk in the solid footwall, to guard against drawing, which was retimbered, 1905. This mine has about 8,000' of underground workings, not including worked-out stopes. The lense is 30' to 85' in width, and is opened for a distance of 1,030', on the third level. Production of the Burra Burra, 1905, was 131,654 tons of ore, with reserves of 2,225,000 tons in sight, at the end of the year.

The London mine has a lense of 25' to 75' width, 500' in length on the first level, and has a 588' shaft. Work was suspended at this property, 1904, but was resumed, 1905, with a production of 63,373 tons for the year, reserves of ore in sight being estimated at 445,000 tons.

The Polk County mine, opened by a 300' shaft, has an ore body of 20' to 90' width, and of undetermined length and depth. Production, 1905, was 17,802 tons of ore, with reserves of 315,000 tons.

Diamond drill borings show further ore, estimated at 1,070,000 tons, giving the mine total ore reserves exceeding 4,000,000 tons. The company also owns valuable iron lands, including the Eureka iron mine, operated, under lease, by the Virginia Iron, Coal & Coke Co.

The mines have a complete machinery plant, including water-tube boilers, Nordberg first-motion hoists, and a Nordberg cross-compound two-stage air-compressor. The shafthouses are a sort of cross between the rockhouses of the Lake Superior native copper mines and the concentrators of the copper ore mines, each equipped with a 100-h. p. compound engine, 18x31" crushers, 42x144" screens and 36"x33" Robins conveying-belts, for hand-sorting, these shafthouses having a daily crushing and assorting capacity of about 2,000 tons, ore being reduced to 4" size. The Burra Burra shafthouse is 127' in height.

The smelter, at Isabella Junction, is a little north of the old Tennessee mine, and one to five miles from the other mines of the company. Ore is taken to the smelter over the company's 7½-mile standard-gauge private railroad, connecting with the Atlantic, Knoxville & Western line, and equipped with four 50-ton locomotives and 65 thirty-ton ore cars. The company owns about 60 dwellings for employees.

The smelting plant, designed and built by Mr. Channing, is admirably planned, material being handled throughout by gravity, wherever possible. The smelter was greatly enlarged, during 1905. There formerly were three 56x188" water-jacket blast-furnaces, and four new furnaces have been added, these being 56x270" at the tuyeres, nearly trebling the smelting capacity of the plant. The furnace building is of steel, with large ore-bins,

and the charging floor is 18' above the tuyeres, furnaces being charged from 2-ton cars, drawn by electric locomotives. The plant includes six blowing engines, one being the largest ever built. This has a steam-end with three cross-compound cylinders, with a 15" high-pressure cylinder and 32" low-pressure cylinders, having a 42" stroke, with 6 blowing cylinders, each 70" in diameter, delivering blast at 3 lbs. pressure per square inch. The furnace building also has a 25-ton refining stack. Slag-pots are handled by electric locomotives, slag being used for railroad ballast. The converter department has 3 stands, with 15 shells, 84x126", of the trough type, with a horizontal blowing engine for converter blast, and a 40-ton electric crane, which is to be duplicated.

The power-house at the smelter is of steel frame, with brick walls, enlarged during 1905, having 250-h. p. and 1,000-h. p. water-tube boilers, with a complete electric light plant.

The process of smelting has been changed radically, semi-pyritic smelting being substituted for the old method of preliminary roasting. The change has cut down production for two years, and has necessitated the enlargement of the reduction plant, but the first benefits were felt, 1905, in considerably reduced costs, and during 1906 the new system will begin giving its full benefits, in both reduced costs and enlarged production. The management hopes to smelt, during 1906, about 500,000 tons of ore, and make therefrom circa 18,000,000 lbs. fine copper, at a cost, not exceeding 7.5 cents per pound. In 1905, despite a limited output, total cost of blister copper, f. o. b. cars at the smelter, was only 8.08 cents per pound, a decrease of 1.1 cents per pound from the previous year, fully justifying the change made in the system of reduction. The extraction was only 34.82 lbs. per ton of ore smelted, making the cost only \$2.81 per ton of ore treated, the items entering into this cost being, mining and hoisting, 68.6 cents; development, 17.1 cents; crushing and assorting, 10.6 cents, transportation, 12.8 cents, blast furnace smelting, \$1.24; converting, 23.13 cents, and engineering, laboratory and miscellaneous, 20.8 cents. These figures speak eloquently of plant, system and management. Lower grade copper ores are treated elsewhere, at a profit, but in such cases there are gold and silver values to sweeten the product, which are lacking in the case of the Tennessee.

The product is shipped to Europe, as blister copper, electrolytic refining not being required, because there are no values in the precious metals worth saving, and no impurities of importance requiring elimination.

The smelter of the company is located in the extreme southeastern corner of the state of Tennessee, and the prevailing winds carry the bulk of the fumes into the state of Georgia. Suits brought against the company have resulted in permission by the federal court to postpone the action indefinitely, which is a victory for the company. The bull is to be taken by the horns, however, and an acid plant is to be built, during 1906. This will be one of the most important acid works in the United States, having a daily capacity of 400 tons of 60° Beaumé sulphuric acid. This plant will be designed and equipped on the same thorough and technically correct

lines as the other works of the company, and will make high-grade acid at very low cost. The location of the Tennessee plant is such, being readily reached from the more important phosphate fields of the south, that the manufacture of superphosphates should prove a highly remunerative industry, and though nothing has been said of the matter, it is probable that so wide-awake a management has not failed to canvass the situation.

Production, 1905, was 7,977,982 lbs. fine copper. Both production and the work of enlarging the smelting plant were hampered somewhat by a scarcity of labor—a trouble that is acute and threatens to become chronic in the south, owing to the marvelous industrial development now taking place in all of the southern states. Notwithstanding the minor drawbacks enumerated, the Tennessee made very substantial progress during 1905, and its successful future, under the present highly efficient and advanced management, is not open to question.

TERANO MINE.

JAPAN.

Mine office: Saretani-mura, Iyo-gori, Iyo, Japan. Ore is chalcopyrite, associated with iron pyrites, carrying 4% to 5% copper. Vein, traversing chloritic schist, ranges up to 7' width, with an average of 12" to 24" only. Production, 1898, was 25,974 lbs. fine copper.

MINA TESORE DE SONORA.

MEXICO.

Mine office: Nacozari, Sonora, Mexico. Lands, sundry claims, south of Nacozari, near the Yaqui river, including the old Todos Santos, an antigua, which once had a smelter, as evidenced by a large slag-dump. Old workings were shallow, it being evident that only oxidized ores were mined and smelted. The property has been idle for a century or two, records being lacking. Ores have given assays up to 28.7% copper, 27.8% lead and 139 oz. silver per ton.

TETON COPPER MINING & SMELTING CO.

WYOMING.

Letter returned unclaimed from former office, Jackson Hole, Wyo.

TEXADA COPPER MINING CO.

BRITISH COLUMBIA.

Out of business. Fully described in Volume V.

TEXAS CONSOLIDATED MINE.

CALIFORNIA.

Office: care of W. H. Garlick, owner, 438 East Ohio St., Marquette, Mich. Mine office: Redding, Shasta Co., Cal. Property is primarily a gold mine, and is said to have produced circa \$1,000,000 values in 8 years, previous to 1904, under a former ownership, but is now idle, except for a little work by tributors. Property is said to carry undeveloped but promising copper veins. Has electric power and a 20-stamp mill. Ore production, by tributors, is sold to the Keswick smelter of the Mountain Copper Co., Ltd.

TEXAS CONSOLIDATED MINES & POWER CO.

CALIFORNIA.

Dead. Property sold, circa 1904, to W. H. Garlick.

TEXAS COPPER CO.

TEXAS.

Office: care of Glenn N. Congdon, Gowanda, N. Y. Organized July, 1902, under laws of New York, with capitalization \$1,000,000. Lands, sundry claims, in Texas, carrying indications of copper, salt and gypsum. Idle.

TEZIUTLÁN COPPER CO.**MEXICO.**

Organized under laws of New Jersey, with capitalization \$1,000,000, shares \$100 par. Is controlled, through ownership of stock, by the Teziutlán Copper Mining & Smelting Co.

TEZIUTLÁN COPPER MINING & SMELTING CO.**MEXICO.**

Office: 82 Beaver St., New York. Mine office: La Aurora, via Teziutlán, Puebla, Mexico. Employs 1,600 men. Geo. D. Barron, president; Robt. S. Towne, vice-president and treasurer; S. W. Reynolds, second vice-president; preceding officers, A. Foster Higgins, W. J. Best, E. W. Gould, Jr., Henry L. Nelson, Henry Shepard and R. H. Carter, directors; E. Percy Smith, manager; C. J. Nourse, secretary and auditor; R. E. Safford, assistant secretary and treasurer; A. F. Schneider, mill superintendent; E. Du B. Lukis, engineer. Organized April, 1905, under laws of New Jersey, with capitalization \$10,000,000, shares \$100 par. Owns the entire capital stock of the Teziutlán Copper Co., and other properties, and has a close working connection with the Compañía Metalúrgica Mexicana. Earnings of the old company were \$794,013 in 1904, and dividends of the old company were \$450,000 in 1904, and \$578,326 in 1905. Dividends are to be paid quarterly, by the new company, at the rate of 6% per annum, beginning January, 1906. Annual meeting, first Thursday in June. State Street Trust Co., Boston, transfer agent.

Lands include the Aurora mine of the Teziutlán Copper Co., area 4,500 acres, also sundry other properties, giving total holdings of circa 7,000 acres of mining rights, with a 15-acre smeltersite and 400 acres miscellaneous lands, 10 miles from Teziutlán and about 130 miles east of the City of Mexico. Company is said also to have bought Los Ocotes mine, in 1906. The climate is equable, and the property is surrounded by fine arable lands. The labor supply is adequate, and of good character.

La Aurora mine is opened mainly by tunnels, and has developed a considerable body of auriferous and argentiferous chalcopyrite, associated with sphalerite, giving average assays of circa 8% copper, up to 200 grams silver and 5 grams gold per ton, with circa 15% iron, 20% sulphur, 10% calcium and 30% silica. The mine has an extensive surface plant, including a complete hydro-electric power installation, for which water is brought, by a 3,600' flume, under a 900' head, generating 1,000 h. p., which is transmitted electrically to the mine, about 6 kilometers from the power-plant.

The smelter, adjoining the mine, and receiving ore therefrom by aerial tram, has three 250-ton blast-furnaces, and the management plans adding another of the same size. Product is shipped as converter bars, averaging 98.6% copper. The mines and smelters are connected, by a 10-mile electric railway, with the Interoceanic Railroad of Mexico, at Teziutlán. Production, 1905, was 7,512,252 lbs. fine copper, 286,012 oz. fine silver and 3,057 oz. fine gold. The management is good, and this property seems the most successful and promising copper mine in Southern Mexico.

THARSIS SULPHUR & COPPER CO., LTD.**SPAIN.**

Offices: 136, West George St., Glasgow, Scotland. Mine office: Alosno, Huelva, Spain. Sir Charles Tennant, Bart., chairman; preceding officer,

A. Brown, L. O. Schmidt, Sir J. King, Bart., T. Alexander, H. Gaskell, E. M. Chalvet, René Millet and A. J. J. Messéan, directors; Alex. Moore, Jr. and Robert C. Mackenzie, auditors; Wm. P. Rutherford, general manager; Geo. Gray, superintendent; G. Reid, secretary. Organized October 27, 1866, with capitalization £1,250,000, shares £2 par. Has paid dividends yearly, since 1868, ranging from 5% in 1869 to 37½% in 1898. Dividends were 17½% yearly for 1903, 1904 and 1905. For the 39 years ending 1905, the company has paid dividends of 750⅓%. Net profits for 1905 were £225,135 6s. 11d.

Lands include the Tharsis group, area 1,143 hectares, and the Lagunazo group, area 271 hectares, at Alosno, about 30 miles west of the Rio Tinto, also the Calañas or Zarza group, area 618 hectares, at Calañas, midway between the Tharsis and Rio Tinto mines. The mines at Alosno were worked by the Romans, and probably by their predecessors as well, and are identified by some with the Tar-ish of the Bible. General geological conditions are much the same as at the Rio Tinto, the mines belong in the southern zone of the Andevallo or Sierra Morena district of Huelva, showing 4 main lenses, these having their axes of greatest length southeast by northwest. The largest lense is the Criadero del Sur, to the south. The Filon del Norte, to the north-east, is about 600 meters long and 140 meters in extreme width. The smaller lenses are the Criadero de la Sierra Builones and the Filon del Medio, to the northwest. The Tharsis and Lagunazo have been the principal producers in the past, but are nearing exhaustion. The Calañas is developing rather better than expected, and now has ore reserves for about 10 years' production. The company also is developing the Almagrera and Triunfo groups, near Alosno, and the Vulcano mine, at Alosno, is under investigation.

During 1905 the Sierra Builones mine yielded 82,869 long tons of ore, and 83,620 cubic metres of overburden were removed therefrom, in opening the eastern extension of the lense. During the year the Calañas mine yielded 329,903 long tons of ore, and 279,986 cubic metres of overburden were stripped. At the Lagunazo operations were confined to leaching the tereros.

The ores of the Tharsis average about 3% copper, 50% sulphur, and 45% iron, with small quantities of gold, silver, lead, zinc, nickel, bismuth, antimony and arsenic. After extraction the ore is piled in heaps and weath-ered, this process being assisted by occasional sprinkling. The leach-water goes into creosoted timber sluices, where the copper in solution is deposited on pig-iron. The company owns a railroad leading from the mine to Corrales, and has a shipping pier at that port. During 1905 two locomotives and 50 freight-cars were added to the equipment of the railway. The company also owns extensive works at Hebburn-on-Tyne, Willington-on-Tyne, at Oldbury, a suburb of Birmingham, at Garngad, a suburb of Glasgow, and at Cardiff, Wales.

Owing to the exhaustion of its principal ore bodies and a rather alarming annual decrease in production, the company has been endeavoring for several years to secure new mines, and with that end in view has investigated sundry properties in Norway, Italy, Cyprus, Russia, Mexico, Canada, Tennessee and Arizona. The company bought the Aamdal mine, at Mo, Bratsbergamt, Nor-

way, which made 240 tons of refined copper in 1895, and gave the property considerable development, proving up a large ore body of lower grade than expected, hence the mine was sold to a Norwegian syndicate. The company optioned the Trotter mine, at Webbwood, Algoma, Ontario, in 1905, but did not find the ores suitable, and abandoned the option. The company still is in the market for a mine of cupriferous pyrites rich in sulphur, with large bodies of ore.

Production of copper was 11,147 long tons in 1898, 7,967 tons in 1900, 6,708 tons in 1902 and 5,620 tons in 1904, showing a decrease of nearly one-half in six years, owing to the partial exhaustion of the largest Spanish ore bodies. Production, 1905, was 12,590,226 lbs. fine copper, which was slightly less than would have been made but for a serious drought in Southern Spain, which continued during the following winter, and will restrict the 1906 output also. The management is good, and it is to be hoped that the company, which has a long and highly honorable record as a profitable copper producer, may be able to secure new mines, to replace its Spanish properties nearing exhaustion.

THOMPSON SIDING COPPER-GOLD MINES, LTD. BRITISH COLUMBIA.

Dissolved, August, 1904.

THREE BEARS MINING CO.

NEW MEXICO.

Lands sold, circa 1905, to Southwest Smelting & Refining Co.

THREE CRIPPLES MINE.

WYOMING.

Office and mine: Esterbrook, Albany Co., Wyo. G. W. Johnson, manager.

THREE JAYS COPPER CO.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Alberni, B. C.

THREE PEAKS MINING CO.

CALIFORNIA.

Office: care of T. S. Henderson & Co., 500 Commercial Bldg., St. Louis, Mo. J. J. Chambers, vice-president and general manager. Lands, in Trinity county, California, are said to show gold-copper ores. Moribund.

THREE R MINE.

ARIZONA.

Mine office: Patagonia, Santa Cruz Co., Ariz. Has tunnels aggregating circa 400' length, showing a large body of disseminated chalcopryite, estimated to average 3% to 4% copper. Said to have been sold, circa April, 1906, to residents of Pittsburg, who plan vigorous development.

THUMB BUTTES MINING & MILLING CO.

ARIZONA.

Mine office: Prescott, Yavapai Co., Ariz. Employed 15 men, at last accounts. Lands, sundry claims, 8 miles west of Prescott, opened by a tunnel.

**VEREINIGTE THÜRINGISCHE KUPFERBERGBAU
GEWERKSCHAFT.**

GERMANY.

Mine office: Gotha, Saxe-Coburg-Gotha, Germany. Karl Gürtler, manager. Property is the Carl Alexander, Sophie, Carl August, Bernhard and Wilhelm Ernst mines

ASOCIACION DE PROPIETARIOS DE LAS MINAS

SPAIN.

DEL TIBIDABO.

Offices: Moncada 31, Barcelona, Spain. Mine office: Cassolas, Barce-

lona, Spain. Property is the mina San Gervasio de Cassolas, showing a chalcopryite ore body. Idle for some years.

TICON MINE.

MONTANA

Office and mine: care of James A. Murray, owner, Butte, Silver Bow Co., Mont.. Lies east of the Speculator mine, and has a 500' shaft, sunk on the pitch of the vein, showing about 4' of good ore at the bottom.

TILT COVE COPPER CO., LTD.

NEWFOUNDLAND.

Offices: 9, Queen St. Pl., London, E. C., Eng. Col. J. W. Young, chairman; E. C. Leaver, secretary; John Taylor & Sons, managers. Organized Apr. 4, 1888, with capitalization £200,000, shares £2 par: issued, £178,000. Freehold lands include the Tilt Cove mine, at Tilt Cove, Newfoundland, leased for 99 years to the Cape Copper Co., at an annual rental of £4,400, plus one-half of net profits earned, lease being terminable on a year's notice from the lessees. Dividends were 5.5% in 1903, 7.5% in 1904 and 7.5% in 1905.

TIMBER PEAK MINING CO.

NEW MEXICO.

Mine office: Socorro, Socorro Co., N. M. Ores carry gold, silver and copper. Has steam power and a concentrator. Apparently moribund.

TINGEN MINE.

NORTH CAROLINA.

An old and idle mine near Roxboro, Person county, North Carolina.

TINTIC COMPANY.

UTAH.

Office: Salt Lake City, Utah. Organized 1903, under laws of Maine, with capitalization \$3,000,000, shares \$5 par, increased, 1906, to \$4,000,000. Is the parent company of the Tintic Mining & Development Co., Yampa Smelting Co., and West Mountain Tramway Co., and is a securities-holding corporation only.

TINTIC MINING & DEVELOPMENT CO.

UTAH.

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capt. Henry Stern, president; Geo. H. Robinson, general manager; W. J. Craig, superintendent; James W. Neill, consulting engineer and metallurgist. Organized 1896, with capitalization \$3,000,000, shares \$5 par, and reorganized January, 1906, under laws of Maine, with capitalization \$3,500,000, shares \$5 par. The 100,000 shares of new stock provided by the reorganization were underwritten at \$7.50 per share, and money raised therefrom was used to liquidate a floating debt and to provide a reserve fund for working capital. Is subsidiary to the Tintic Company, and is managed as a close corporation.

Lands are sundry claims in the Tintic district, on which heavy expenditures have given indifferent results, and the Yampa group, area circa 180 acres, on Carr Fork, near the Utah Consolidated and Boston Consolidated mines, showing a vein of 10' to 37' width, carrying disseminated chalcocite, covellite and chalcopryite; with an average tenor of 3.4% copper and from \$2 to \$5 combined gold and silver values per ton. Ores are highly ferruginous, making them valuable for fluxing the silicious ores of the Bingham district. The Yampa mine has upwards of two miles of underground workings, being developed by two tunnels and a 1,700' shaft having 7 levels and connecting at the bottom with the Craig tunnel, through which ore is removed.

The Craig tunnel is 3,248' long, striking the main vein at about 2,200' and connecting at 2,448' with the shaft. It is planned to install electric traction in the Craig tunnel. The upper, or Yampa tunnel, intersects the shaft at 475' and runs about 1,000' on the vein, ore from the Yampa being sent down the shaft to the Craig tunnel. Machinery plant includes 7-drill and 10-drill Rand air-compressors, and a hoist actuated by compressed air.

The smelter, at Yampa, is to be connected with the mine by a $2\frac{1}{4}$ -mile aerial tramway, which will be the longest in the camp. This will be a very valuable addition to the property, insuring prompt and economical handling of a large and steady ore tonnage. The smelter has two 250-ton Allis-Chalmers water-jacket blast-furnaces, 2 reverberatory furnaces and 12 McDougall roasters, of which 1 reverberatory and 6 roasters were added March, 1906, nearly doubling the capacity of the works. The plant includes ore-bins, power plant, blast-furnace building and calcining building. The main stack has an elevation of 287' at the top from the tuyeres. It is probable that a converter plant will be added. Some trouble has been had with neighboring farmers, who complain of damage from fumes.

At the end of 1905 the mine was producing circa 20,000 tons of ore monthly, and production, 1905, was 4,069,886 lbs. fine copper. The Yampa has an excellent management and is a valuable property, with prospects of becoming a considerable producer, within the next few years.

TINTO MINE.

AUSTRALIA.

Mine office: Murrin Murrin, Western Australia. Has secured assays of 16% copper, 20 oz. silver and 1 oz. gold per ton. Presumably idle.

SOCIEDAD LE LAS MINAS DE COBRE TINTO Y SANTA ROSA.

SPAIN.

Office: Rue Archimedes, 1, Brussels, Belgium. Mine office: Zalamea la Real, Huelva, Spain. Capitalization, 3,000,000 francs. Lands, 114 hectares, including El Tinto, Santa Rosa and 9 other old mines. Has a 7-kilometre aerial tram to Calañas. Property is leased to the United Alkali Co., Ltd.

TIPTON COPPER CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Tularosa, N. M.

TIP TOP COPPER CO.

ARIZONA.

Office: Commonwealth Bldg., Philadelphia, Pa. Western office: 7 Coles Blk., El Paso, Texas. Mine office: Helvetia, Pima Co., Ariz. John Tarner, president; S. Charles Pratt, vice-president and general manager; Geo. M. Aman, secretary and treasurer. Organized 1902, under laws of Arizona, with capitalization \$1,150,000, shares \$1 par. Lands, 24 claims, area 400 acres, including the Tip Top and Copper Duke claims, also a 100-acre millsite, in the Helvetia district, showing 3 contact veins, averaging 14' width, giving average assays of 5% copper and 1 oz. silver per ton, with a trace of gold, from carbonate and sulphide ores, opened by 7 shafts, of 10' to 150' depth, and several tunnels, longest 958', with about 4,000' of underground openings. Has gasoline power and has developed considerable ore. Presumably idle.

TIP TOP COPPER CO.

NEW MEXICO.

Office: 290 Third St., Milwaukee, Wis. Letter returned unclaimed from former mine office, Silver City, Grant Co., N. M. Capitalization, \$2,000,000.

Dr. V. F. Mueller, president; P. T. McGrath, vice-president and general manager; Geo. W. Kliegel, secretary; Fritz Bock, treasurer. Lands, 4 claims, area circa 70 acres, lying near the Comanche and Burro Mountain groups, showing promising outcrops of both high and low grade ores, but apparently no work has been done on property, and company presumably is moribund.

TIP TOP MINE. **IDAHO.**

Office: care of J. Q. Packard, general manager, Worthington Bldg., Salt Lake City, Utah. Mine office: Doniphan, Blaine Co., Idaho. J. A. Lusk, superintendent, at last accounts. Lands, 12 patented claims, area 220 acres, in the Hailey district, developed by shafts of 500' and 1,000', with 7,000' of underground openings. Has a complete steam plant, 20-stamp mill and 50-ton cyanide plant, working cupriferous gold ores.

TIP TOP MINE.

ONTARIO.

Office: care of Col. S. W. Ray, Port Arthur, Ont. Mine office: Kashaboiwe, Rainy River district, Ontario. Employs 10 men. Richard Sandoe, superintendent. Was held formerly by the New York-Canadian Copper Co., Ltd.

Lands, 4 claims, being locations K62, K63, K64 and K65, area 336 acres, freehold, 6 miles from Kashaboiwe, on Round Lake, in Moss township, showing country rocks of schist and diorite, carrying 3 contact veins, ranging up to 150' width, with 2 of 25' average width, carrying circa 18' of ore giving average assays of 7% copper, 5 oz. to 12 oz. silver and \$1 to \$2 gold per ton. Development is by shafts of 50' and 208', with 640' of workings, estimated to show 35,000 tons of ore. Property has a 100-h. p. steam plant, including hoists of 10-h. p. and 30-h. p., and a 5-drill Ingersoll-Sergeant air-compressor. Property is considered promising.

COMPAÑIA MINERA DEL TIRO GENERAL, S. A.

MEXICO.

Office: 2-a Ojcaliente No. 8, Aguascalientes, Mex. Mine office: Charcas, San Luis Potosí, Mexico. Employs 750 men. J. G. Creveling, Jr., president and general manager; W. F. Layer, vice-president; G. B. Wardman, secretary and treasurer; preceding officers, Thos. J. Ryder and O. F. Westlund, directors; DeWitt Creveling, superintendent; E. J. Cloyd, assistant superintendent; William Mueller, mine superintendent; Pablo Fuentes, engineer; W. O. Staples, auditor. Organized July 31, 1902, under laws of Mexico, with capitalization \$375,000, Mexican, shares \$100 par. Dividends, 1905, were \$150,000, Mexican, and \$48,750 in the first quarter of 1906.

Lands, 71 pertenencias, area 176 acres, also 25 acres of millsites and a 50-acre farm, in the Charcas district. The mine shows 2 main systems, carrying fissure veins in eruptive porphyry, not far from a limestone contact, the North vein averaging 3 meters to 8 meters width, with a known length of circa 450 meters, developed for 350 meters length by shafts of 306m., 200m., 130m., 130m., 90m., 85m. and 55m., with upwards of 3,000 meters of workings on the North, or main vein, showing circa 200,000 metric tons of ore. The workings on the south zone are idle, awaiting the establishment of a concentrating plant adapted to this ore, which is of milling grade. The ore developed in the south zone is almost exclusively sulphide, and averages 2%

copper, 5% lead, 12% zinc, 430 grams silver and 0.8 grams gold per ton.

The mines were discovered circa A. D. 1583, and were worked on a small scale for nearly 3 centuries, and on a larger scale since 1859. The property has a 340-h. p. steam plant for hoisting and pumping, and in addition makes some use of "malacates." Equipment includes 80-h. p. and 100-h. p. hoists and a Cameron station pump, and a 10-drill air-compressor has been ordered. A combination machine and carpenter shop, of stone, has been built, and a complete plant ordered therefor.

Tests have been made, in an experimental mill, on low grade ore, and a stone mill, with iron roof, has been built, and a 100-ton milling equipment ordered. As soon as the mill is tried out, and proven successful, it will be enlarged to 250 tons daily capacity. The mine has a large number of structures, for various uses, all built of stone, including a general store, etc.

The stockholders of this company own the Potosí Central railroad, of 15.1 kilometers length, running from the mine to Las Charcas station, on the Mexican National railroad.

Fuel is Laredo coal, costing \$6.85, gold, per ton, delivered, and eastern coal, costing \$8.40, gold, per metric ton, delivered. Production, 1905, was 2,281,761 lbs. fine copper, an increase of about 20% over the output of the previous year, and the 1906 production should be nearly 2,500,000 lbs. fine copper. Ore shipped, 1905, was 48,000 metric tons, averaging 2.16% copper, and production for first 3 months of 1906 was at the rate of 3,600 metric tons of shipping ore monthly, costing an average of \$4 gold, per dry metric ton, f. o. b. cars of the Mexican National railway.

The company will sink the main shaft 230 metres, and is sinking a secondary main shaft, which should reach a depth of 150 meters by the end of 1906. Some exploring is being done, in new ground, both east and west of the present workings, with promising results, and the company plans installing a concentrator and making a considerable production of milling ore, during the year. The railroad equipment will be increased and a number of new buildings erected. All this work will be done from earnings, without reducing dividends. Company is a close corporation, with only 35 shareholders. The management is exceptionally good, and the property is one of proven merit, with an assured future.

TOKAR (SUDAN) PROSPECTING SYNDICATE, LTD.

SUDAN.

Offices: 7, Devonshire Square, London, E. C., Eng. Sir F. Frankland, chairman; Felix F. Wilson, secretary. Organized December 2, 1904, with capitalization £5,000, shares £1 par. Property is a license, from the Sudan government, to prospect for minerals. Location of prospecting rights is approximately between 17° 30' and 18° North Latitude, and between 37° 45' and 38° 30' East Longitude. Copper float is found over an area of circa 150 miles square, in a mountainous region near the Eyrthrean border, inhabited by the Hasas, a tribe of ebony Arabs. Country rocks are schist, having a strike of west of north, and a westerly dip, associated with eruptive crystalline rocks, showing numerous veins of low grade ore, apparently running about 2% copper only.

TOLEDO MINING & POWER CO.**MONTANA.**

Office: 108 La Salle St., Chicago, Ills. Mine office: Brandon, Madison Co., Mont. Louis D. McCall, president and general manager. Organized circa 1905, with capitalization \$50,000, apparently as successor to Bismarck-Nugget Gulch Consolidated Mining Co., lands of which were sold, 1905, at sheriff's sale. Capitalization of the old company was \$5,000,000 and capitalization of the new company is much nearer the actual value of the lands. Apparently the management is the same as that of the Bismarck-Nugget Gulch.

Lands, 17 copper claims and 18 gold claims, 3 groups of copper claims being on Stone Creek, in the Ruby Mountains. Property has a 60-ton concentrator and a 30-ton smelter. Mining operations are confined to the gold claims, but the copper claims are said to be promising.

SOCIÉTÉ ANONYME MINES METALLIQUES DE TOLOSA.**SPAIN.**

Offices: Monceau les Mines, France. Mine office: Leiza, Navarra, Spain. Capitalization, 715,000 francs, in 1,430 shares, par 500 francs. Property comprises iron mines in Guipúzcoa, and lead-copper mines at Navarra, latter including the Regina and other mines, which were undergoing development, but were not arrived at a producing stage, at last accounts.

TOLTEC CONSOLIDATED MINE.**MICHIGAN.**

Office: care of Alfred Meads & Sons, Marquette, Mich. Lands, 320 acres, near Greenland, Ontonagon county, Michigan. Production, 1851-1860, was 206 tons, 1,443 lbs. fine copper.

TOLTEC MINING & SMELTING CO.**MEXICO.**

Office: care of A. W. Cunningham, president, Waco, Texas. Mine office: Ayutla, Oaxaca, Mexico. Is said to have ordered machinery for a 100-ton concentrator, and to plan shipping concentrates to Teziutlán, Puebla, Mexico, for smelting.

TOMAHAWK COPPER & ZINC MINING CO.**ARKANSAS.**

Letter returned unclaimed from former office, 130 Broadway, New York. Chas. E. Welloone, president; R. A. Blair, secretary. Organized Nov. 16, 1899, under laws of Arizona, with capitalization \$1,000,000. Lands include the Tomahawk copper mine, and sundry zinc claims, in Marion and Searcey counties, Arkansas. Presumably idle.

TOMOHAWK JUNIOR MINING CO.**MICHIGAN.**

Office: care of H. F. Fay, 60 State St., Boston, Mass.

TOM HAL MINING CO.**WASHINGTON.**

Mine office: Pateros, Okanogan Co., Wash. Thos. B. Warren, president and general manager. at last accounts. Lands, 5 claims, said to show a 4' to 10' vein, carrying auriferous and slightly argentiferous chalcopryrite, arsenopyrite and iron pyrites. Has steam power, and is a dead beat. Presumably idle.

TOM MOORE CONSOLIDATED MINING CO.**COLORADO.**

Mine office: Eureka, San Juan Co., Colo. S. G. Martin, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has water power.

TONOPAH-ALOHA MINING CO.**NEVADA.**

Office and mine: care of W. D. Nelligan, president, Tonopah, Nye Co., Nev. F. W. Johnson, secretary. Organized 1903, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 6 claims, in the Lone Mountain district, giving assays up to 12% copper and \$60 gold per ton. Idle.

TONOPAH COPPER MINING & MILLING CO.**NEVADA.**

Office and mine: care of E. C. Day, secretary and treasurer, Tonopah, Nye Co., Nev. E. C. McDow, president; Herman Binnell, vice-president. Organized September, 1905, under laws of Arizona, with capitalization \$2,000,000, shares 50 cents par. Lands, 5 claims, area circa 100 acres, in the Silver Star district of Esmeralda county, about 60 miles west of Tonopah. Company apparently was floated with the assistance of Letson Balliet, a well known promoter of crooked mining companies. Company is sending out 200-shares stock certificates, apparently at random, with request to recipients to pay \$1 per month thereon, and comment seems unnecessary.

TONOPAH GOLD & COPPER MINING CO.**NEVADA.**

Offices: 16-32 State St., Rochester, N. Y., and P. O. Box 600, Spokane, Wash. Mine office: Tonopah, Nye Co., Nev. Edward Evans, president; Thos. R. L. Harris, secretary; J. W. Dunning, vice-president; F. A. Edgerton, assistant secretary; John Harris, superintendent. Organized under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, in the Samo district, formerly known as the Willow Springs camp, circa 40 miles west of Tonopah, opened by an 80' tunnel, showing a quartz vein, carrying values in copper, silver and gold.

TONOPAH-UTAH MINE.**NEVADA.**

Mine office: care of J. L. Justice, manager, Tonopah, Nye Co., Nev. Has secured assays of 9% copper, 42 oz. silver and \$6 gold per ton. Idle.

TOPEKA COPPER CO.**WYOMING.**

Office: 817 Kansas Ave., Topeka, Kans. Mine office: Holmes, Albany Co., Wyo. Employs 4 men. Wm. Benton, president; G. S. Simmons, vice-president; Ira N. Baker, secretary; H. E. Baker, treasurer; Avery T. Holmes, engineer. Organized March 23, 1906, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 3 claims, area 60 acres, known as the Maudem mine, in the Lake Creek district, showing fissure veins in syenite and contact veins between syenite and limestone, carrying a little oxidized ore near surface, with sulphides at depth, in veins of 8' width, giving assays of 12% copper, 9 oz. silver and \$91 gold per ton. Development is by shafts of 30' and 60', and by tunnels of 100' and 345'. Company plans continuing development and adding a light mining equipment.

TORCH LAKE MINING CO.**MICHIGAN.**

Office: care of Thatcher Loring, president, 3-19 Central St., Boston, Mass. Mine office: care of W. W. Stockley, Hancock, Houghton Co., Mich. Capitalization \$500,000, shares \$25 par. Lands, 1,280 acres, being Sections 35 and 36, Town 56 North, Range 33 East, lying east of the Tecumseh and midway

between Calumet and Lake Linden. Was slightly prospected, 1899-1900, by diamond drill borings, and since idle.

TORPEDO MINING CO.

NEW MEXICO.

Office: 135 Adams St., Chicago, Ills. Mine office: Organ, Donna Ana Co., N. M. Geo. E. Wood, president; Harvey E. Rich, secretary; C. B. Rogers, superintendent. Lands, sundry claims, 16 miles west of Las Cruces, near the Copper Bar, opened to a depth of circa 500', on a contact vein between limestone and granite, carrying lenticular ore bodies said to be increasing in size with depth. Property was opened circa 1876, and is said to have produced upwards of 4,000 tons of ore, averaging about 14% copper. Second class ore, averaging 6% copper, is being scrambled and shipped from the waste-dumps. Has steam power and a fair mining plant. Idle since 1903, owing to the inflow of circa 800 gallons of water per minute. Property is considered promising.

COMPANIA METALURGICA DE TORREON.

MEXICO.

Office and works: Torreón, Chihuahua, Mexico. Ernest Madero, president; Carlos Gonzales, secretary; J. P. Pender, general manager; Donald R. Morgan, mine superintendent; E. Haines, smelter superintendent. Capitalization increased, 1905, to \$5,000,000, Mexican, all issued, in \$1,500,000 preferred 6% redeemable stock, and \$3,500,000 common stock. Profit, 1904, was \$629,279.50, Mexican, or 18% on the existing capitalization.

Lands are several promising lead mines and partly developed copper mines, including properties recently bought in the Santa Barbara section of the Parral district of Chihuahua. Company is said to have leased La Fortuna mine, near Los Muertos station, on the Mexican International railroad.

The reduction plant includes a concentrator, lead and copper smelter and briquetting plant, with 8 furnaces of 1,000 tons daily capacity, which it is planned to increase circa 50% by installing 3 extra furnaces and a converter plant. Production, 1903, was 874,346 lbs. fine copper, and in 1904 the company treated 201,612 metric tons of ore. Company is said to have a concession, from the government of the state of Chihuahua, for building a reduction plant at Santa Barbara. The property is said to have been under option to the American Smelting & Refining Co., at \$4,500,000, Mexican, but the option was not exercised, and the Torreón company refused to extend the same. This is one of the most important independent smelting plants in the republic, and is a well managed and successful property.

TOSTON COPPER COMPANY.

MONTANA.

Office: Pennsylvania Bldg., Butte, Mont. Mine office: Toston, Broadwater Co., Mont. David J. Charles, president; Emil H. Renisch, vice-president; John A. Shelton, secretary; W. K. Edwards, general manager. Organized Dec. 24, 1903, under laws of Arizona, with capitalization \$1,250,000, shares \$5 par. Lands, 6 claims, area 120 acres, showing 3 fissure veins in porphyry, with a 200' shaft in a vein of about 15' average width, carrying chalcopryite assaying 6% copper, 1 oz. silver and \$2 gold per ton. Idle at last accounts.

TOTTENVILLE COPPER CO.**NEW YORK.**

Office and works: Tottenville, Staten Island, N. Y. Company manufactures copper and brass, in various forms.

TOWADA MINE.**JAPAN.**

Owned by Fujita-Kumi & Co.

TRAIL SMELTER.**CANADA.**

Described under title Canadian Smelting Works.

TRAINER MINE.**COLORADO.**

Mine office: Ascroft, Pitkin Co., Colo. Michael Hogan, owner. Has argentiferous lead and copper ores.

TRAMWAY MINE.**MONTANA.**

Described under title Snohomish and Tramway mines.

TRANSVAAL COPPER CO.**MEXICO.**

Office: 1408 Traction Bldg., Cincinnati, Ohio. Mine office: Cumpas, Moctezuma, Sonora, Mexico. Louis J. Hauck, president; R. A. Koehler, vice-president; J. M. Eilers, second vice-president; O. C. Rasch, secretary; Alfred Vogeler, treasurer; L. G. Cloud, consulting engineer; preceding officers, Louis Hehman and B. Freiberg, directors; Arthur W. Jenks, manager; Dr. A. Sandberg, smelter superintendent; James T. McDonald, mine superintendent; W. F. Neihart, cashier. Organized December, 1901, and reorganized July, 1903, under laws of West Virginia, with capitalization \$6,200,000, shares \$10 par; issued, \$2,700,000.

Lands, 794 pertenencias, area 1,966 acres, also a 50-acre smelter-site and 25,000 acres of timber and grazing lands, in the Moctezuma district, showing 3 ore bodies, occurring as fissure veins and lenses, on which upwards of 16,000' of development work have been secured. The Cobre Rico vein is opened by 2 shafts and 2 tunnels. Shaft No. 1, depth 200', shows ore averaging 8% copper, 4 oz. silver and \$1.50 gold per ton. Shaft No. 2, depth 140', gives similar assays. Tunnel No. 1, length 135', gives ores averaging 9% copper, 3 oz. silver and \$1.50 gold per ton. Tunnel No. 2, length 600', gives average assays of 4% copper, 3 oz. silver and \$1.50 gold per ton. A large amount of ore has been exposed on this vein, which is very wide.

Transvaal No. 1 has 2 shafts and one tunnel. No. 1 shaft, 210', is in ore. No. 2, the working shaft, is 318' deep, with steam hoist, 2 Cameron pumps, two 80-h. p. boilers and a Sullivan air-compressor. Levels have been opened on the 300' lift and considerable ore blocked out, this averaging 3% to 8% copper, 3 oz. to 4 oz. silver and \$1 to \$1.50 gold per ton.

The Buckeye mine, with about one-half mile of workings, has a vein ranging 18" to 50" in width, assaying 12% to 20% copper, 10 oz. to 35 oz. silver and \$1.50 gold per ton, with 2,500 tons blocked out for stopping, at last accounts.

The San Nicolás has a 250' shaft in a 4' vein carrying silver-lead values averaging about \$45 per ton, with about 3,000' of openings and 6,000 tons blocked out for stopping. The mine has a steam hoist, two 80-h. p. boilers and a Sullivan air-compressor.

The Virginia gold mine carries a vein said to average 15' width, with average values of about \$12 per ton, in gold, developed by circa 1,000' of workings.

The copper and silver-lead ore bodies occur as fissures, and also as wide mineralized dykes, in trachyte and rhyolite. Copper ores are mainly bornite and chalcopyrite, with occasional chalcocite, carrying the usual oxide and carbonate ores on the outcrops. The ore bodies of the Cobre Rico and Transvaal are mineralized dykes of apparently 200' to 300' width, carrying low-grade copper sulphides, associated with iron pyrites and having a quartzose gangue, hence liable to prove silicious and require heavy fluxing. The Cobre Rico and Transvaal No. 1 are estimated by the management to show about 2,500,000 tons of low-grade ore.

Improvements at the mine include an engine-house, boiler-house, shaft-house, office, laboratory, boarding-house, 22x90' general store, and 6 dwellings. There also is a store at the smelter. Nearest railroad is the Nacosari line, 36 miles distant, but the Cananea, Rio Yaqui y Pacifico has surveyed a projected line into this district.

A 35-ton reverberatory furnace, at the Buckeye mine, was blown in, early in 1905, but was closed down, owing to unsatisfactory operation, and rebuilt, being blown in again, circa November, 1905, and is said to be doing satisfactory work, making matte carrying up to 65% copper, 55 oz. silver and \$7 gold per ton.

The main smelter is at Cumpas, 15 to 20 miles from the mines, and it is planned eventually to build, at this point, reduction works having both lead and copper stacks, with daily capacity of circa 1,000 tons, to be connected with the mines by a narrow-gauge line that will traverse a rugged country, and will neither be easy nor cheap of construction. It was necessary that the mine smelter be located at Cumpas, where there is a good site and ample water supply. The plant includes a 150-ton water-jacket blast-furnace, 42x120" at the tuyeres, and a 20-ton reverberatory furnace. Equipment includes a Connorsville blower, three 80-h. p. boilers, and a tandem-compound engine, there being power and room for two additional 150-ton stacks in the blast-furnace building. The new smelter was blown in May 1, 1906, and is working matte averaging 40% copper, 100 oz. silver and 0.5 oz. gold per ton, from ores reported by the company to average about 10% copper. Product is shipped for refining to the Nichols Chemical Works, and the company does a general custom business, in addition to treating its own ores, having a small sampling mill and a custom ore department.

The management of the Transvaal company is composed of solid business men, who have their own money in the venture, and stock sales were discontinued early in 1905. The property gives promise of making a valuable mine, but the management doubtless will find that rail connections are required to render the property capable of treating the average of its ores at a profit.

TRANVAAL COPPER CO., LTD.

TRANVAAL.

Offices: 109, Victoria St., London, S. W., Eng. J. B. Davis, secretary.
Organized Aug. 15, 1899, with capitalization £150,000, shares £1 par., issued,

£1,225. Was formed to take over issued capital of the Subeni River (Transvaal) Mining Syndicate, Ltd. Inactive.

TRANSVAAL COPPER MINING CO., S. A.

MEXICO.

Is the Mexican incorporation of the Transvaal Copper Co.

TRANSVAAL GROUP.

BRITISH COLUMBIA.

Office: care of John M. Turnbull, lessee, Trail, B. C. Mine office: Ashcroft, Yale district, B. C. Lands, sundry claims, 18 miles southeast of Ashcroft, held under bond and lease, presumably in the interests of the Canadian Pacific railway.

COMPAGNIE DES MINES DE TRANSYLVANIE.

HUNGARY.

Mine office: Brussels, Belgium. Organized 1903, with capitalization 2,000,000f., to develop mines of copper, lead, zinc, ochre, and coal, in Hungary.

GEWERKSCHAFT TRAUTENSTEIN.

GERMANY.

Mine office: Benneckenstein in Harz, Braunschweig, Germany. A. Polednick, manager. Has 2 shafts, the Gertrude, of 36 metres, and the Silber-Marie, of 162 metres, developing ores carrying zinc, lead and copper. Employed circa 30 men, at last accounts.

TRAVERS CONSOLIDATED MINING CO.

MEXICO.

Title changed, 1905, to Travers-Durkee Coppers.

TRAVERS-DURKEE COPPERS.

MEXICO.

Office: 805 Rookery Bldg., Chicago, Ills. Mine office: Moctezuma, Sonora, Mexico. Employs 100 men. Richard P. Travers, president; Henry R. Durkee, secretary and treasurer; Thos. Travers, superintendent; W. Lorrain Cook, engineer; Dr. Franklin R. Carpenter, consulting metallurgist. Organized June 14, 1905, under laws of Arizona, as the Travers Consolidated Mining Co., with capitalization \$6,000,000, increased, October, 1905, to \$15,000,000, shares \$10 par, and name changed, December, 1905, to present title. Annual meeting, third Tuesday in June.

Lands, 7 groups of claims, area 1,145 acres, in the Moctezuma district, 80 miles from nearest railway station, at Nacozari. Principal property is the Promontorio mine, in the Promontorio Mountains, circa 35 miles southeast of Moctezuma, near the Yaqui river. Country rocks are diorite, granite and limestone, showing sundry ore bodies, occurring in a large shear zone, between diorite and granite. One ore body, under development, is circa 300' wide, on the tunnel level, 300' below the crest, and is reported by the company to carry values of 20% copper for a width of 30', 12.5% copper for a width of 60', and 2.25% copper for the balance of 210'. Values in precious metals are given as 3 oz. silver and \$4 gold per ton, in the high-grade ore and \$1 silver per ton in the low-grade ore. The high-grade ore is chiefly bornite, and the lower grade is disseminated chalcopyrite. Company reports that 10' of the ore in the 30' paystreak will average above 40% copper, being massive bornite. Development is by a 125' shaft and by tunnels of 175' and 500', with total underground workings of 1,125', estimated by the company to show 360,000 tons of high-grade ore and 1,440,000 tons of low-grade ore, which seems excessive. Property is an antiqua, and is said to have produced the copper from which were cast the bells on the old church at Moctezuma, built A. D. 1640.

During the American Civil War, some of the bornite was packed on mules, to Guaymas, 40 miles, and shipped to Swansea, for reduction.

Mine is developing without steam power, by tunnels, but the company plans utilizing a large available water power, on the Yaqui river. The company is shipping a little ore, in three grades, of 40%, 30% and 20% copper, all under 20% being held at the property, awaiting a smelter, which is being built $1\frac{1}{2}$ miles from the mine. The smelter will have 150 tons daily capacity, presumably making matte, and will do custom smelting of gold and silver ores.

TRAVERSELLA MINES, LTD.

ITALY.

Voluntarily wound up, December, 1902.

TRAVONA MINE.

MONTANA.

Office and mine: care of Hon. W. A. Clark, owner, Butte, Silver Bow Co., Mont. Martin Buckley, superintendent. Is an old property, originally a silver mine, in the southeastern part of Butte.

GEORGE A. TREADWELL MINING CO.

ARIZONA.

Office: 27 William St., New York. Mine office: Mayer, Yavapai Co., Ariz. Employs 35 men. Prof. Geo. A. Treadwell, president; Walter S. Logan, vice-president and treasurer; Miss Myra B. Martin, secretary; Walter S. Logan, treasurer; F. W. Wood, general manager; Frank W. Giroux, superintendent; A. J. McNulty, smelter superintendent; Geo. H. Kramer, engineer. Organized 1899, under laws of West Virginia, with capitalization, increased Jan. 21, 1905, to \$3,500,000, shares \$10 par. Controls the Brookshire Mining Co., through ownership of 80% of stock. Annual meeting, first Wednesday in February.

Lands, formerly reported as 102 patented claims, area 1,861 acres, are reported by company, April 10, 1906, as 60 patented claims, area 1,200 acres, also 180 acres of mill and smelter sites, in the Jerome, Big Bug, Peck and Agua Fria districts. Lands were supposed, 1905, to be held under a \$200,000 bond and lease, partly paid. Mines are reported, 1906, as including the Brookshire, Hackberry, Boggs, Iron Queen and Cliff, and previously included also the Badger, Pastime, Crystal, Wallace and Agua Fria groups, some of which doubtless are yet held by the company.

Country rocks are Yavapai schists, magnesian slate and rhyolite, ore bodies occurring as replacements in the slate, following rhyolite intrusions. Formation has a generally east and west strike, with dip of 60° to 80° southward. Five ore bodies have been developed, to various extents, these averaging 5' width and formerly being claimed by company to give average assays of 5% copper, 5 oz. silver, and \$5 to \$50 gold per ton, from chalcopyrite. Latest report, 1906, by company, gives average values, from bornite and chalcopyrite, of 3% copper, 10% zinc, 5 oz. silver and \$2 gold per ton, which is much nearer the truth than the former claims, and probably is a very close approximation of the actual average value of the ore. Ores are said by the company to be self-fluxing.

The various mines of the company are developed by shafts of 485', 350', 375' and 100', and by tunnels and drifts of 7,700' aggregate length. There also are numerous shallow shafts and short tunnels of an exploratory nature.

Principal development is on the Brookshire group, having upward of a half-mile of workings, showing considerable milling ore of 4% to 5% copper tenor, with fair gold and silver values. The Hackberry, deepest opening 500', and quite wet, has nearly one-half mile of workings on an 8' vein, and has two parallel veins, said to be of 9' and 7' width, latter claimed to carry ore averaging 10% copper and \$10 gold per ton, which is an exaggeration. The Boggs, Cliff and Iron Queen mines all have considerable development. Mines as a whole are estimated by present management to show 80,000 tons of ore, with 40,000 tons blocked out for stoping, latter figure being a decrease of one-third from estimate of the previous year.

The mines have a 240-h. p. steam equipment, and the old smelters have 40-h. p. steam and 80-h. p. water plants, and the new smelter has a 160-h. p. steam plant. The mine has four 40-h. p. hoists, 12x14", good for 500' to 1,000' each, and a 2-drill Knowles air-compressor, with 3 power drills. Shops include a 40x65' wood machine-shop, 20x30' smithy, office, boarding-house, bunk-house and dwellings, with a total of 40 buildings for various uses.

The concentrator, 75x100', of wood, has two 24" Dodge crushers, three centrifugal crushers and 2 concentrating tables, and is rated by the company at 200 tons daily capacity, utilizing a new method of dry concentration.

The company controls a private narrow-gauge railway line, known as the Hackberry & Iron Queen Railroad, circa 5 miles in length touching the Hackberry, Boggs and Queen mines, and connecting at Arizona City with the Sante Fé line, which reaches the new smelter, at Mayer. Equipment includes 2 locomotives and 9 cars.

Water is secured at Crystal Springs, 8 miles distant, and is delivered at the smelter through a 4" pipeline, under a head of 1,150', the water supply being good.

The company has three smelters, of which two are useless. The old Boggs, or Commercial smelter, has a calciner and two 40-ton water-jacket blast-furnaces. This is on the line of the narrow-gauge line, but is hopelessly antiquated in design and equipment, and was inherited from a preceding ownership.

A hydro-carbon smelter, designed to burn petroleum and to turn out blister copper from ore, by a single fusion, was built at Arizona City, by the company, under the advice of Prof. Treadwell, the president. This proved a flat failure, although the company advertised it as a great success, and sold considerable stock on the strength of its alleged "revolution" of existing processes of reduction. The hydro-carbon smelter is fully described in Vol. IV.

The third smelter, which is the second built by the company, is at Mayer. It was designed by Erwin D. Treadwell and is well planned and substantially constructed, embodying only features of proven worth. Mr. E. D. Treadwell, by the way, who was the only director of the company of whom any commendatory words could be said, seems to have severed his connection with the management, as he has been succeeded by a new general manager—a change upon which Mr. Treadwell is to be congratulated.

The new smelter, at Mayer, standing west of the old oil-smelter, has a 200-ton Mitchell economic hot-blast furnace, and a Connersville blower driven by an 18x22" Erie engine. There are 2,500-ton storage-bins for ore, coke and limestone, with gates for loading into tram-cars for charging. Slag is granulated and washed out in launders. The old oil-smelter is to be remodeled into a reverberatory, and used for smelting flue-dust and concentrates. Product of new smelter, when working, is matte carrying 35% to 40% copper, 40 oz. to 60 oz. silver and 1.5 oz. to 2 oz. gold per ton, to be shipped for refining to the Aguascalientes plant of the American Smelting & Refining Co., which will be perhaps the first instance of American matte going to a Mexican refinery.

The company plans deepening the Hackberry shaft to 800', reopening the Iron Queen mine and extending the workings in the Boggs.

Production, 1905, was 4,000 tons of ore smelted, giving copper, silver and gold values averaging \$10 per ton. It is not likely that there will be any production during 1906.

For seven years the George A. Treadwell Mining Co. has been peddling its shares to widows, orphans and fools. For seven years its lying advertisements have promised impossibilities. For seven years this stock-jobbing corporation has paid out a large part of its income from stock-sales in advertising more shares for sale. These lying advertisements have been signed by Miss Myra B. Martin, but the other officers of the company are equally culpable, even though they may take refuge behind her petticoats.

To list the lies uttered by this putrid corporation would require pages of this volume. The company has lied about its mines, its ores, its smelters, its furnaces and its earnings. It has glorified Prof. Geo. A. Treadwell as the most eminent metallurgist of this or any other age, but how capable Prof. Treadwell is in this line was shown by his abortive hydro-carbon smelter. It has held him up, in the public prints, as the discoverer of the United Verde and the Greene Consolidated—brazen lies both. If the truth be in the company, or any of its directors, the fact has been most effectually concealed. The advertisements of the company always carry the same burden—just a little more stock for sale—buy it quick, and get rich.

The series of excuses put forth for several years are paltry prevarications. First the company needed just a few dollars to finish opening its mines—then a few dollars to complete a smelter—then a few more dollars to do more mining—then money to build another smelter, after which cash would flow in streams from the furnaces, the mines having immense ore reserves, merely awaiting the completion of the smelter—then, when the second smelter was built—just a few dollars to buy ore—then a few dollars more to open the mines. The second smelter is idle, the company's mines lacking ore to feed it, and apparently the company's excuse for asking cash to buy ore was just a blind to rake in a few more dollars. The mines are much lower in grade than claimed, and are inadequately developed.

The whole outfit should be jailed, for securing money under false pretenses.

TRENTON MINING & DEVELOPMENT CO.**MONTANA.**

Office: 42 Broadway, New York. Mine office, Butte, Silver Bow Co., Mont. Employs 375 men. John D. Ryan, managing director; John Gillie, general superintendent; Geo. F. McGee, mine superintendent. Organized 1905, under laws of New Jersey. Title changed, circa 1905, from Colorado Mining & Smelting Co. Capitalization \$2,500,000, entirely owned, except founders' shares, by the Amalgamated Copper Co.

Lands, 35 quartz and placer claims, mainly fractional, area 220 acres, including the Gagnon and Otisco mines, in the western limits of the Butte copper zone, ores being highly zinciferous and argentiferous. The Gagnon mine has a 3-compartment shaft, 1,950' deep, sunk at an angle of 74°, with an air shaft of 1,800' depth 700' to the westward. The Gagnon mine is timbered with square sets, using round timber, and shaft was partly retimbered, in 1906. Mine has electric call-bells and is connected underground with the Original main shaft, the Gagnon shaft being only 150' from the Original shaft, the Gagnon carrying the continuation of the Original vein, and showing very good ore at the bottom.

The Gagnon mine has a 22x48" Dickson hoist, with 1½" round rope, hoisting two double-deck cages for men, changed for raising ore to two single-deck cages with two 3-ton skips swung under. Miscellaneous equipment includes a 20-drill Rand air-compressor and 2 Aldrich electric pumps, with capacity of 100 and 200 gallons per minute, respectively, working against a head of 1,000'.

The reduction plant, at Butte, has a concentrator and furnaces with 750 tons daily capacity, but lacks a converter. In addition to treating the Gagnon ores, this plant did a general custom business, until closed down, 1904, since which time this company's ore is sent to the Butte & Boston plant, at Butte, and to the Washoe works, at Anaconda. The old reduction plant is being held in reserve, for emergency use. Daily production, February, 1906, was circa 550 tons of 3% copper ore, and production of 1905 is estimated at 12,500,000 lbs. fine copper.

MINA TRES GRACIAS.**CHILE.**

Office and mine: Chafaral, Atacama, Chile. Basilio Caceres, owner; Roberto Caceres, manager. Has steam power and employs circa 100 men.

TREVEDDOE MINING CO., LTD.**ENGLAND.**

Officers: 13, Throgmorton Ave., London, E. C., Eng. Mine office: Bodmin, Cornwall, Eng. W. H. Adams, secretary. Organized Aug. 13, 1900, with capitalization £100,000, shares £5 par; issued, £95,000. Debentures, £17,500 authorized, £15,500 outstanding, at 5%. Lands, 500 acres, held on 100-year lease, subject to rental and royalty, bearing tin and copper ores. Production, 1902 was 60 tons of black tin and 175 tons of 7% copper ore. Operations, 1904, resulted in a net loss of £2,250.

TREVIÑO y ZERTUCHE.**MEXICO.**

Office and mine: Viesca, Coahuila, Mexico. Lands include groups of mines carrying gold, silver, lead, copper and iron. Idle for several years.

**TRI-BULLION SMELTING & ARIZONA, MONTANA & NEW MEXICO.
DEVELOPMENT CO.**

Office: 119 Monroe St., Chicago, Ills. Mine offices: Kelly, Socorro Co., N. M., and San Carlos, Gila Co., Ariz. Employs 50 men. Hon. Howard Paschal, president and general manager; John B. Meacham, first vice-president; J. P. Hendricks, secretary; John W. Dundee, treasurer; preceding officers, Hon. John B. Corliss, Robert K. Brown, Louis J. Pierson, James Russell, Dr. R. J. Marshall and W. Topping, directors; Henry C. Erman and W. C. Defty, engineers; R. Skiff Shelden, chairman advisory committee. Organized 1903, under laws of Arizona, with capitalization \$5,250,000, shares \$1 par.

Lands include zinc property in New Mexico and copper property in Arizona. The Michigan gold mine, near Ishpeming, Marquette county, Michigan, was sold, 1905, to the Ishpeming Gold Mines Co., in which the Tri-Bullion holds a stock interest. Lands also include the Tri-Bullion group, in Jefferson county, Montana, idle at last accounts.

The Kelly mine, 13 claims, near Magdalena, New Mexico, is primarily a zinc mine, carrying values mainly in carbonates averaging 30% zinc, but has a little copper as well, values apparently changing from zinc to copper at depth. Development is by 3 shafts. The main working shaft, started 1905, has 3 compartments and was 120' deep at the end of the year, there also being a 210' two-compartment shaft. The Kelly has a steam plant and various mine buildings, and is producing considerable zinc ore.

The Arizona claims include the Tri-Bullion group of 8 gold and silver properties, apparently idle, and the Starlight group of 14 copper and lead claims, located in Godless Gulch, in the Stanley Butte district, 8 miles south of San Carlos. The Starlight mine was discovered 1886, but lands were set aside later, as part of the San Carlos Indian reservation, and were not segregated until 1901. Work by present company was begun January, 1903. Country rocks are quartzite, porphyry and limestone, showing occasional granite and diorite, carrying 3 known lenses of 20' estimated average width, showing oxide and carbonate ores, giving average assays of 8% copper, 10 oz. silver and \$4 gold per ton, in addition to values in lead, zinc, antimony and bismuth. The high grade ores run 8% copper, 40% lead, 10 oz. silver and \$3.50 gold per ton. Considerable ore carrying circa 3% copper and 10% lead, with small gold and silver values, has been blocked out. The ore body, of 3' to 20' width, has given assays up to 32% copper, with considerable gold and silver values. The ore is low in silica and rich in lead and iron, rendering it self-fluxing, notwithstanding the existence of deleterious elements.

The principal claims are the Starlight and Will Ryan groups. The Starlight has shafts of 140' and 200', and a tunnel, planned to cut the main vein at a distance of 1,000', giving a back of 500', which already has cut 2 smaller veins showing auriferous and argentiferous copper ore. The Ryan crosscut tunnel is about 1,200' long, and the property shows large reserves of low grade ore. Survey has been made for a 3,000' tramline, with a 22%

grade, from the Starlight mine to the wagon-road in Kelly gulch. The property shows the remains of an old adobe smelter, 100 years or more of age, as evidence that the mines were worked formerly by Mexicans or Spaniards. The Southern Pacific and Santa Fé railroads are said to have united to build a railway to Box Cañon, on the Starlight side of Gila river, which will serve this property.

The Kelly zinc mine was a considerable producer, during 1905, of slightly cupriferous zinc and lead ores, and the Starlight mine shipped ore netting \$6,876. Management seems good, and property is considered promising.

TRIMETALLIC MINING, SMELTING & REFINING CO. MEXICO.

Office: care of P. Sandoval, treasurer, Nogales, Ariz. J. L. Shepard, president. Presumably organized under laws of Arizona. Lands, 9 groups of claims, in the Ures and Hermosillo districts, Sonora, Mexico, with a government concession for the equivalent of about 100,000 miners' inches of of water from the Yaqui river, which, under an effective head of 160', can be made to develop a large water-power. Property shows auriferous and argentiferous copper ores. Management is considered honest and property of more than average promise, but development is hampered by Yaqui Indian troubles.

TRIMOUNTAIN MINING CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Trimountain, Houghton Co., Mich. Employs about 800 men. Wm. A. Paine, president; Fred-eric Stanwood, secretary and treasurer; F. W. Denton, general manager; preceding officers, Chas. A. Paine, Chas. A. Snow, and J. Henry Brooks, directors, John Jolly, mining captain; H. T. Mercer, engineer; Edw. Koepel, mill superintendent; Benj. D. Noetzel, clerk; Jas. Vial, master mechanic at mine; James Richards, Jr., master mechanic at mill; Will Harris, supply clerk. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; paid in, \$20. Is controlled, through ownership of 99,135 shares of stock, by Copper Range Consolidated Co. Paid \$300,000 in dividends under a former management. Old Colony Trust Co., Boston, registrar. Annual meeting, second Wednesday in February. Ended 1905 with cash on hand, \$536,269.29, with total quick assets of \$1,095,814.93, and total liabilities of \$1,025,325.80, including old indebtedness, from the former management, of \$540,542.49.

Lands, 1,120 acres, being the E. $\frac{1}{2}$ of Sec. 19, W. $\frac{1}{2}$ of Sec. 20, N. $\frac{1}{2}$ of Sec. 29 and NE. $\frac{1}{4}$ of Sec. 30, all in Town 54 North, Range 34 West. The Baltic lies to the north and the Champion to the south, with undeveloped lands to the east and west. The Trimountain has a very heavy sand overburden surmounting the ledge, hence the mine was opened by sinking drop-shafts through the sand and crosscutting to the bed, raising thence to surface, on the angle of the lode. The Baltic bed runs 15' to 50' wide on the Trimountain tract, with an average width of about 25', being well mineralized throughout, mass and barrel copper occurring near the walls. Masses upwards of a ton in weight have been found, but values occur mainly in the stamp-rock. Shafts are all of the same size and style, being 8x22' outside

of timbers, with three compartments, framed with 14x14" sticks, exceptionally heavy timbering being required to withstand the pressure from the shifting sand above the solid rock. Development of the mine was begun in 1899.

No. 1 shaft, 1,230' deep at the end of 1905, sunk at an angle of 68°, is about 210' north of the Champion boundary line. This shaft has a sand overburden of about 40', with first level opened 168' below the collar, levels being 100' apart from thence downward, developing a long stretch of exceptionally uniform stoping ground of high grade. No. 1 has a 2,500 h. p. Nordberg direct-acting duplex hoist, having 36x72" cylinders and double conical drum of 18' maximum diameter, with capacity to hoist 6-ton skips from one mile depth. The shaft-rockhouse is of wood.

No. 2 shaft, 1,023' northeast of No. 1, is 1,210' deep, sunk at an angle of 68°. The hoist is a duplicate of that at No. 1. The shaft-rockhouse is 40x62' on the ground and 84' high, of steel frame, iron-sheathed, having 2,000-ton rock-bins, equipped with engine, steam-hammer and two 18x24" crushers.

No. 3 shaft, 1,027' northeast of No. 2, sunk at an angle of 68°, is 1,100' deep, with a sand overburden of about 60'. Ground is much disturbed above the second level, but the formation becomes more regular at greater depth, showing many good stopes. Hoist and shaft-rockhouse are duplicates of those at No. 2.

No. 4 shaft, 710' deep, is showing good ground. The shaft-rockhouse is a duplicate of those at shafts 2 and 3. The hoist is a temporary engine, good for a quarter-mile depth, and is to be replaced, eventually, with a hoist similar to those at shafts 1, 2 and 3.

No. 5 is in embryo as yet. The overburden at the site selected for No. 5 is 238' in depth, of sand, mixed with boulders, and probably best could be penetrated by an upraise.

No. 6 also is merely a tentative site for a shaft, so located as to develop the Trimountain territory to the Baltic line.

The Trimountain was very rich, from surface to the 7th level, below which came considerable poor ground, but the eleventh and twelfth levels show marked improvement. Lying parallel with and circa 65' west from the Baltic lode is a very wide amygdaloid, carrying some heavy copper and considerable stamp rock. This has been opened by a crosscut from the 7th level of No. 1 shaft, and has been explored to some extent, but nothing of great importance has been found. The great average width of the lode has led to successful experiments in dry-walling with waste-rock. Though at first ridiculed by some conservative mine managers, the use of culls for underground walls has proven its worth in the mines of the Baltic lode, and is being adopted in other Lake Superior mines having the same general underground conditions. Waste-rock is used also for building underground chutes. These are roughly circular, with inner diameter of about 5', and are built up and filled about with waste as the stopes are carried upward, the chutes

being built up at a sharp pitch. It was feared that descending rock might catch upon projections of the inner wall, built of rough mine-rock, but in practice no such trouble has occurred, the wedging of the surrounding waste-rock serving to hold the walls immovable. The saving in timbering from the use of dry-walling and mine-rock chutes is very great.

The principal mine buildings and machinery, in the neighborhood of shafts 2 and 3, include a 32 x 45' machine shop, 40x60' carpenter shop, 25x45' smithy and 30x60' warehouse. There is a 35-drill cross-compound Rand air-compressor at No. 2 shaft, with a Deane condensing plant in a separate building adjoining. At No. 3 shaft the power plant is housed in a 68x180' steel building, the plant including a battery of Stirling water-tube boilers and a 4,500' Nordberg air-compressor, guaranteed to run 45 drills only, but actually running 65 drills, 10 pumps and sundry pneumatic machinery, giving a total duty equal to running 90 drills, or twice the rated capacity. At No. 3 there is a large coal trestle, supplying fuel to the boiler-room, and a cistern near No. 2 shaft stores water from a small brook for the boilers. A house over the cistern has a fire-pump, with hose, for defense of the mine buildings. It is planned to make more extensive use of electric power, for shafts and surface plants, and eventually for underground pumping.

There are a large boarding-house, general store and upwards of 100 dwellings at the mine location, which is enjoying a good growth and is improved with well macadamized roads. The mine is served by the Painesdale branch of the Copper Range railroad.

The 100-acre millsite, at Beacon Hill, 2 miles west of Redridge, has about one mile frontage on Lake Superior. The mill is 176x205', of steel, on stone foundations, equipped with 4 Nordberg stamps, which were steeple-compounded during 1905, the washing machinery for each stamp consisting of 36 improved Hodge jigs, 6 slime tables and one Wilfley table. The mill has a small but complete machine-shop, for repairs, on the second floor. The steel boiler-house has four 250-h. p. and two 200-h. p. Stirling water-tube boilers, latter maintaining a steam pressure of 180 to 200 lbs. per square inch, which is the highest pressure carried at any mill in the district, with a brick-lined self-supporting steel smokestack, 7' 6" in diameter and 165' high, and an addition is being built for two 250-h. p. Stirling boilers. At the rear of the boiler-house are 3 coal-trestles, under each being a 6x7' tunnel 400' long, leading to the boiler-rooms, the floors of the sheds forming the roofs of the tunnels. Feed water for boilers is piped from a small stream, dammed 1,000' distant.

The steel pump-house at the millsite has a 20,000,000-gallon Nordberg pump, taking water from a well connected with a 40" riveted steel pipe, running 1,400' to an intake crib in Lake Superior. The crib, which is built of heavy timbers, braced by iron rods, is 42x56' on the bottom and 31' high, sunk in 21' of water, weighted with 1,800 tons of rock and anchored into the sandstone bed of the lake by heavy iron rods. The 40" water-pipe is laid on the floor of the lake from the crib until shallow water is reached, and anchored to the rock bed of the lake by eye-bolts. The 500' of this line nearest

shore lies in a 14' trench covered with a cement sunk in sacks. Miscellaneous buildings at the mill include a smithy and carpenter shop, each 18x30', and a 24x36' warehouse. The townsite of Beacon Hill, lying on the slope above the mill, has a number of dwellings, the townsite and mill buildings being lighted by electricity, supplied by a dynamo in the engine-room of the mill.

The Trimountain began production Jan. 4, 1902, with one leased head at the Arcadian mill, starting a second leased head in April. Two heads in the Trimountain mill were started in 1902, and when the third and fourth heads were started, in 1903, use of the Arcadian mill was discontinued. Production begun with 37 lbs. fine copper per ton, but fell off later to 27 lbs. per ton. When the present management assumed control, the production fell sharply, from 27 lbs. down to 18 lbs. per ton, and was 18.36 lbs. per ton in 1905. The reason for this sudden decrease in percentage is not far to seek. Thomas W. Lawson, the immaculate critic of financial crookedness in high places, was the owner of a majority of the Trimountain stock, and forced the old management to operate the mine on a radically wrong basis. The mine was gouged, rich rock removed and production maintained at a high level, through wilfully robbing the mine, at the expense of its future. By these tactics dividends aggregating \$300,000 were squeezed out, in 1903, yet the mine was turned over to the Copper Range with a floating debt of upwards of \$750,000. The Lawson management is blighting, because fundamentally dishonest. The Trimountain was rescued from Lawson's corrupt dictation in time, and under the honest and capable management now enjoyed, is slowly but surely getting upon an absolutely sound and profitable basis.

Production, 1905, was 10,476,462 lbs., a small gain over the previous year. Cost of copper was 10.5 cents per pound for all ordinary expenses, or 10.93 cents per pound including construction expenses. Cost of rock stamped was \$1.59 per ton for all ordinary working expenses, or \$1.67 with construction included. Only 7.5% of the rock hoisted was discarded, thanks to the system by which culls are made useful underground, instead of being a dead expense for hoisting and surface-wasting. The mine is looking better underground than for three years past. The management is highly capable and efficient.

TRINITY COPPER CO.

CALIFORNIA.

Office: 33 State St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Forces, one \$10,000-a-year general manager and two \$3-a-day watchmen. Thos. W. Lawson, president; Wm. Riley, vice-president; Homer Albers, secretary; Allen Arnold, treasurer; preceding officers, Louis Auerbach, Arthur P. French, Henry H. Arnold, Frank E. Chase and Kenneth K. McLaren. (McLaren is a New Jersey "guinea-pig," who is a director in a vast number of New Jersey corporations, good, bad and indifferent) directors; Austin H. Brown, general manager; American Loan & Trust Co., Boston, transfer agent; International Trust Co., Boston, registrar.

Lands, 1,700 acres, also a 422-acre smelter-site and a patented townsite, near Kennett, giving total landed holdings of 3,655 acres. Principal mining

lands are the Shasta King and King Copper groups. The Shasta King group, 12 claims, is 4 miles east of Iron Mountain, on the south fork of Squaw creek, adjoining the Balaklala mine. Development is by tunnels, main tunnel being 7x8' and 1,145' long, with double tram-tracks and a 7x8' double-track tunnel has been driven 175' lower. The mine has about 7,400' of underground openings and the tract has been partially explored by 5,119' of diamond drill borings. Ore body is a lense, claimed to be approximately 150' wide by 1,000' long, of unknown depth, said to give evidence of strength and to be likely to prove persistent to good depth. The mine is claimed, by the management, to have 1,200,000 tons of ore in sight, with nearly 500,000 tons blocked out for stoping, but this statement is denounced by Lewis W. Aubury, state mineralogist of California, who is a competent authority and an honest man, as a gross and wilful prevarication. The crosscut tunnels, driven in from the sides of the mountain, are connected by drifts in the ore body. Ore is a low-grade disseminated chalcopryite, averaging somewhere between 1% to 4% copper, with about \$1 gold and silver values per ton. Rumors have been printed that the ore body is merely a blanket vein, pinching out just below present workings, but best evidence is that the ore body is a lense of unknown but probably considerable depth.

The King Copper group of 22 claims, about 2½ miles south of the Shasta King, has about 1,000' of development work, no ore having been found in place, as yet. The Statesman group has been explored, with a view to locating and developing silicious ores required for fluxing. The Uncle Sam group, held under option and lease by the Trinity, also has been explored for fluxing ores, the Trinity having large bodies of low-grade cupriferous pyrites, but lacking the silicious ores required to make free-smelting furnace mixtures. Some oxidized ore has been found at and near surface, this running 3% to 8% in copper tenor.

Surface improvements include a \$20,000 office building, assay-office, hospital, warehouse, shops and about 25 dwellings for employes. The operating plant has steam power, a 6-drill air-compressor, power-drills and one diamond drill.

The company made a bluff at building a smelter, doing some grading in 1901, but the site has been sold since, and is occupied by the new smelter of the Mammoth Copper Co.

At the company's annual meeting, February, 1905, the president, Lawson, was authorized to build a smelter "according to specifications" submitted by general manager Brown." There are no evidences of this smelter materializing.

There is considerable speculation as to what has become of the \$972,000 of working capital intrusted to president Lawson, several years ago. No financial statement has been vouchsafed by the virtuous Lawson for some years. Presumably he has been too busy writing magazine articles attacking the Amalgamated Copper Co. In order to find funds to build the new smelter, the Boston Stock Exchange kindly permitted Lawson to list the balance of the Trinity stock, amounting to 80,000 shares, early in 1905. The Boston Stock Exchange has enjoyed an exceptionally good reputation heretofore,

but this matter of listing such utterly rotten stock as the Trinity is calculated to shake faith in the exchange. What the Boston Stock Exchange needs—and needs badly—is enough courage to back up its honest convictions.

In the prospectus of the Trinity Copper Co., issued Oct. 20, 1900, Lawson predicted that from August, 1901, the net earnings of the company would be “at least” two or three millions dollars yearly, and by that time “at least” \$30,000,000 worth of ore would be blocked out. The mine is said to have been bought by Lawson for \$165,000 and a stock consideration, and was capitalized at the modest sum of six millions, that being Lawson’s idea of the “square deal” to his followers.

Lawson’s mining career is malodorous. He boomed Arcadian at \$75, and later it went to 75 cents. He unloaded Butte & Boston at a fancy price on his trusting employers, the Amalgamated. He gutted Trimountain and paid dividends when the mine owed nearly or quite a million dollars. He did the dirty work for the Amalgamated, and later pretended to expose that company. The Trinity is a fake, and the Boston Stock Exchange is an accessory after the fact.

TRINITY MINING CO.

MEXICO.

Office: care of Pierce Underwood, 140 Dearborn St., Chicago, Ills. H. C. Reno, manager. The extensive advertising of this company is peculiarly unilluminating, the important facts given in the two-column advertisement of the company consisting of the name of the company, the alleged fact that its property is located in Sonora, Mexico, and the company’s desire to sell its shares to the public, in order to permit investors to accumulate large profits suddenly.

TRIUMPH GOLD-COPPER CONSOLIDATED SMELTING, LAND & IRRIGATION CO.

A fraud, promoted by the notorious Wm. F. Wernse gang of swindlers. MINA TROMPOSOS.

MEXICO.

Office and mine: care of D. Luis Frey, owner, Unión de Tula, Jalisco, Mexico. Lands, 12 pertenencias, 12 miles east of Autlán, carrying a 30-metre vein, opened by a 100’ shaft, developing ore assaying 8% copper and 30 oz. silver per ton. Is a small producer, shipping ore to local smelters.

TROUT CREEK COPPER MINING CO.

Letter returned unclaimed from former office, Tacoma, Wash.

TROY COPPER CO.

ARIZONA.

Merged, 1902, in Troy-Manhattan Copper Co.

TROY GOLD MINING CO.

COLORADO.

Mine office: Granite, Chaffee Co., Colo. G. Falconer, superintendent. at last accounts. Ores carry gold, silver and copper. Has steam power and a 20-ton concentrator.

TROY-MANHATTAN COPPER CO.

ARIZONA.

Office: 25 Broadway, New York. Mine office: Troy, Pinal Co., Ariz. Employs circa 60 men. John W. Sisson, president; Col. Chas. H. Cutting, assistant to the president and general manager; Vincent P. Tommins, secretary; Thomas Kavanaugh, superintendent; J. C. Devine, mine superintendent.

ent; J. B. Lunn, chief clerk. Organized July, 1902, under laws of Maine, with capitalization \$3,000,000, shares \$10 par. Bonds, \$300,000 authorized, \$78,000 issued.

Lands, circa 1,200 acres, in the Troy district, about 6 miles northeast of Kelvin, with 5 claims more or less developed. Is said to have bonded, for \$170,000, early in 1906, from J. B. Newman, 40 claims adjoining the Manhattan. The various mines have circa 6 miles of workings, and the Manhattan group is claimed to show 500,000 tons of 6% sulphide ore, which probably is an overestimate, as to either quality or quantity, or both.

The Troy property, which includes the Alice and other groups, with aggregate area of 567 acres, has 4 shafts, including a 500' two-compartment main shaft, and about 7,000' of tunnels. The main working tunnel of the Alice is circa 1,700' long, intersecting the lode at a depth of nearly 800'. It is planned to connect the mouth of this tunnel with the smelter by an aerial tram. Ores of the Alice are slightly auriferous and argentiferous oxides and sulphides, ranging 8% to 16% in tenor, smelter returns for 1902 having given an average of about 10% copper. Vein is 3' to 11' in width, increasing at bottom of shaft, where it is very soft and requires spilling. The 400' Sisson shaft shows a 6' vein of sulphide ore, apparently a fissure in limestone, said to average about 5.5% copper.

The Buckeye has a 375' two-compartment shaft, in a 5% ore body having a 2' paystreak assaying 9% copper, and the Buckeye winze is said to show a 25' vein of malachite giving smelter returns of 6% to 10% copper. On the '91 claim there is a 2' to 8' vein of wulfenite, from which the company plans to produce commercially, a 40-ton concentrator having been built for the purpose, near the Davis shaft.

Equipment includes 2 gasoline hoists, a Leyner air-compressor and an electric plant. Petroleum is used exclusively for fuel. The old 60-ton smelter, at Riverside, on the Gila river was blown in, early in 1901, and closed down permanently, August, 1904. The plant never ran regularly, and experienced much trouble from shortages of both coke and water. The new smelter was blown in January, 1905, but closed down after 10 days run, owing to serious washouts that prevented receipt of both coke and petroleum. Just why the new smelter has not been in blast since is not apparent. The management makes frequent changes in plans and at last accounts was planning yet one more reduction plant. Company is said to have a molybdenum refining plant, at Newark, N. J., but this statement has not been verified. Property is 75 miles from a railroad, and production cannot be put on a satisfactory basis until rail connection are secured. Results, to date, have been disappointing.

TRUE BLUE COPPER MINES, LTD.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Ainsworth, B. C.

TRUST RUBY MINE.

COLORADO.

Letter returned unclaimed from former mine office, Ouray, Colo.

TSCHOUDAK MINE.

RUSSIA.

A small producer in the Russian Altai. Has a vein ranging up to 24' width, carrying chalcopyrite, with quartz gangue.

TSUBOI MINE.**JAPAN.**

Mine office: Tsuboi-mura, Kume-gori, Mimasaka, Japan. Ore is chalcopyrite, associated with iron pyrites, said to average 13% copper and 0.2% silver, occurring in three principal veins of 2' to 4' width, running parallel to plane of stratification of paleozoic clay-slate and schalkstein. Production, 1903, was 218,808 lbs. fine copper.

AKTIEN-GESELLSCHAFT TUBALKAIN.**GERMANY.**

Mine office: Adenau, Rheinprovinz, Germany. Has ores of copper, lead and iron. Idle at last accounts.

TUBUTAMA MINING & REDUCTION CO.**MEXICO.**

Mine office: Tubutama, Altar, Sonora, Mex. Lands, 300 pertenencias, including a number of antiguas, adjoining the Sonora Mining & Milling Co. Property said to be promising. Idle.

TUCK MINE.**VIRGINIA.**

Owned by Pontiac Mining Co.

SOCIÉTÉ DES MINES DE TUÇO-CHEIRA.**PERÚ.**

Office: 50, Blvd. Hausmann, Paris, France. Mine office: Casilla 10, Huaraz, via Casma, Perú. Capitalization, 2,500,000 francs.

TULAROSA MINING & MILLING CO.**NEW MEXICO.**

Mine office: Tularosa, Otero Co., N. M. Lands, sundry claims, 10 miles from Tularosa. Shipped a sample carload of ore to the Copper Queen smelter, at Douglas, Arizona, September, 1905.

MINA TULIPAN.**CHILE.**

Mine office: Chañaral, Atacama, Chile. Zoilo Rojas, owner; R. Olquin, superintendent. Has steam power and employed 50 men, at last accounts.

TULLY COPPER MINING CO.**COLORADO.**

Office: Encampment, Wyo. Mine office: Pearl, Larimer Co., Colo. Leo Davis, president and general manager; F. J. Lordier, secretary and treasurer; J. D. Tully, superintendent. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 12 acres, patented, also a 6-acre millsite, showing 4 fissure veins, carrying oxide and carbonate ores, of which one, opened by a 175' shaft, is said to average 25' width and to carry average values of 6% copper and \$4 gold per ton. Has steam power.

TUNABERG MINE.**SWEDEN.**

A Swedish property, producing mainly silver, with lead and copper as by-products. Main shaft was 588' deep, at last accounts.

TUOLUMNE COPPER MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized, circa June, 1906, with capitalization \$800,000, shares \$1 par. Lands, one fractional claim, in litigation, adjoining holdings of the North Butte.

TURGOVSKI WORKS.**RUSSIA.**

Mine office: Perm, Russia. D. T. Zaharovski, manager. Production, 1900, was 111,686 lbs. fine copper.

TURK MINING & MILLING CO.**WASHINGTON.**

Office: Davenport, Wash. Mine office: Turk, Stevens Co., Wash.

A. H. Stiles, superintendent. Ores carry gold, copper and silver. Was developing, on a modest scale, at last accounts.

TURQUOISE COPPER MINING CO.

ARIZONA.

Mine office: Gleeson, Cochise, Ariz. W. H. McKittrick, superintendent, at last accounts. Presumably idle.

TUSAS PEAK GOLD & COPPER MINING CO.

NEW MEXICO

Office: 364 River St., Manistee, Mich. Mine office: Tres Piedras, Taos Co., N. M. Louis E. Morris, president; Constantine Fleissner, vice-president; J. W. Sibbens, secretary; Otto Rosenfeld, treasurer; Frank Bolton, superintendent; preceding officers, Max Bauman, J. W. Murray, James De Ball and Felix Grant, directors. Organized under laws of New Mexico, with capitalization \$2,000,000, shares \$1 par.

Lands, 13 claims, area 230 acres, in the Bromide district, circa 14 miles west of Tres Piedras. Principal development is on the Tampa mine, said to show a 13' vein of auriferous and argentiferous copper ore, carrying a 5' paystreak of smelting ore and 8' of milling ore. Company claims that some of the ore carries platinum, also that the Tampa mine has a 406' shaft, with 1,300' of workings. Ores are reported by company to assay 5% to 44% copper, 1 oz. to 4.5 oz. silver and \$1.20 to \$3.80 gold per ton, with assays up to 2.2 oz. platinum per ton, and with more or less molybdenum.

The company has installed a hydraulic ram, on Tusas creek, and has a 3-drill air-compressor. At end of 1905, management planned building a 100-ton mill, to do custom work also, and was said to have ordered equipment for same.

TWENTIETH CENTURY GOLD MINING CO., LTD. ONTARIO & ARIZONA.

Office: 29 Broadway, New York. W. K. Dunlap, president; G. Sack, vice-president; Dr. John G. Mollath, secretary; W. Reed McCabe, treasurer; preceding officers and J. V. W. Cook, directors. Organized circa 1898, under laws of Ontario, with capitalization \$2,000,000, shares \$10 par. Company was promoted by one Anthony Blum, a rascal, and paid dividends from stock sales, until January, 1904, when Blum disappeared, and the company became bankrupt. The company has been reorganized, by shareholders, with an entirely new and presumably honorable management, after more or less litigation in the Canadian High Court of Justice.

Lands are in 3 groups, including 2 copper claims in Cochise county, Arizona, 200 acres of gold-bearing lands in El Dorado county, California, and 270 acres of gold lands in the Manitou Lake region, Rainy River district, Ontario, equipped with several small buildings.

TWIN BUTTES MINING & SMELTING CO.

ARIZONA.

Office: 121 Wisconsin St., Milwaukee, Wis. Operating office: Tucson, Ariz. Mine office: Twin Buttes, Pima Co., Ariz. Employs circa 160 men. David S. Rose, president; W. A. Barber, vice-president; preceding officers, John D. Baxter, E. P. Hackett, Edward P. Davis, Robert Nunnemacher and Harry Berger, directors; H. J. Blakely, secretary; W. B. Hill, assistant secretary; Wm. H. Earles, treasurer; John G. Baxter, mine superintendent. Organized September 8, 1903, under laws of Arizona, with capitalization

\$1,000,000, increased, circa 1905, to \$1,250,000, shares \$1 par. Statement of finances, as of date Dec. 1, 1905, gave cash on hand, \$18,000, since which date \$250,000 in treasury stock has been sold, and proceeds will be used to finance the company. Wisconsin Trust Co., Milwaukee, transfer agent and registrar. Annual meeting, first Monday in January.

Lands, 61 claims, area 1,250 acres, partly patented, in the Helvetia district, 28 miles south of Tucson, in the foothills of the Sierrita Mountains. Property was first opened in 1880, but never was successful, owing to lack of cash and management, though always considered rich. Lands carry sundry fissure veins in limestone, and contact veins between limestone and granite, with a limestone footwall and granite-porphry hanging-wall. Development is by a 200' shaft, with 550' of laterals, on the Senator Morgan mine, showing a vein of 25' average width, with proven depth of 95' and proven length of 300', carrying sulphide ore of circa 10% copper tenor in the bottom workings. The Copper Glance mine is opened by a 415' shaft, with 450' of laterals, shaft passing through a 30' iron capping and 200' of carbonate ore, and on the 300' level a crosscut passed through 35' of marcasite, carrying kidneys of chalcocite, and a crosscut on the 400' level encountered a ledge of soft leached ore, considered decidedly promising. The Copper King mine has a 250' shaft, with 250' of laterals, showing carbonates in the upper workings, with sulphides coming in at the bottom, the showing being promising. The various properties of the company have about one mile of underground workings, estimated to give 50,000 tons of ore blocked out for stoping, with 10,000 tons on the dumps, ore averaging circa 7% copper and 1.85 oz. silver, with traces of gold.

Equipment includes a small steam plant at the Morgan, and gasoline power at the Copper King mine. During 1906 the company will install a new machinery plant at the Morgan, to include 300-h. p. boilers, a double-drum hoist good for 3,000', and an 8-drill Ingersoll-Rand air-compressor. The property has 14 buildings, including a machine shop, smithy, engine-houses, store, etc. Water for a smelter can be secured from the Santa Cruz river, 5 miles distant.

The company has a private rail line, known as the Twin Buttes Railroad, 27 miles in length, from Tucson to Twin Buttes, which was completed to the mines circa July 1906. This line will be extended, eventually, toward Nogales. Equipment includes 1 locomotive and 3 flat-cars, to be increased as circumstances may warrant. Fuel is wood, to be replaced by petroleum, as soon as possible.

The company planned shipping circa 200 tons of ore daily, mainly heavy sulphides, with a little oxidized ore, during latter part of 1906. Management is good, and property is considered promising.

TWIN CITY DEVELOPMENT CO.

COLORADO.

Office: care of C. O. Patton, secretary and treasurer, Chicago, Ill. Letter returned unclaimed from former mine office, Turret, Chaffee Co., Colo. W. J. J. Root, president; J. J. New, general manager. Lands, 5 patented claims, known as the Vivandiere group, apparently leased to the Vivandiere

Consolidated Mining & Smelting Co., also the Twin City group, 13 claims, and the townsite of Minneapolis. Mine is opened by a 615' shaft, and has considerable development. Equipment includes a 25-ton concentrator, planned to be enlarged, eventually, to 50 tons daily capacity, which puts about 10 into 1, when working.

TWIN-EDWARDS COPPER MINE CO.**NORTH CAROLINA.**

Office and mine: Greensboro, Guilford Co., N. C. Organized September, 1902, with capitalization \$100,000, shares \$100 par. Lands are sundry old properties, including the Twin mine, with an 18' vein, which was worked previous to the American Civil War. Has steam power.

TWO BIT GOLD & COPPER MINING CO.**COLORADO.**

Supposed to have had claims in the Two Bit district of Colorado.

TYEE COPPER CO., LTD.**BRITISH COLUMBIA.**

Offices: 45, Leadenhall St., London, E. C., Eng. Mine office: Duncans, Vancouver Island, B. C. Works office: Ladysmith, Vancouver Island, B. C. Thomas Headland Wilson, chairman; preceding officer Ludwig Loeffler, Albert Straube, Nicol Brown and Harry Von Berg, directors; Clermont Livingston, general manager; Edward Christopher Musgrove, mine superintendent; Wm. James Watson, smelter superintendent.

Organized April 4, 1900, under laws of Great Britain, with capitalization £180,000, shares £1 par. Dividends were 10% in 1904 and 10% in 1905.

Lands, 13 claims, crown-granted, area 342 acres, also a 45-acre smelter-site, 60-acre tramway terminal and 800 acres timber lands, all in the Somenos district, adjoining the Lenora mine, on Mt. Sicker, circa 11 miles northwest of Duncans, and about 80 miles from Vancouver. Country rocks are schists and diorite, carrying lenses in banded schists, the schists themselves carrying up to 2% copper, with small gold and silver values, and being suitable for fluxing. Ore averages 4% copper, 2.5 oz. silver and \$3 gold per ton, also carrying circa 38% barium sulphate, and about 7% zinc, rendering the ore refractory in smelting. That it is so well smelted is a great credit to the local management of the company.

The main shaft is 1,000' deep, showing a 3' ore body on the 1,000 level. No. 2 shaft is 200' deep, and No. 3 shaft, on the XL claim, with 2 compartments, is 150' deep, and is to be deepened. The mine has about 2 miles of underground workings, showing about a year's supply of ore, though estimated by Mr. Fred O. Harvey at 12,000 tons only.

Equipment, at the mine, includes 5 boilers, 20-h. p. and 50-h. p. hoists, 5-drill and 10-drill air-compressors, and a pumping plant raising 100,000 gallons daily in a single lift of 1,000'. There also is a sawmill and an ore-dressing plant at the mine. The concentrator, at the main shaft, has a No. 4 Gates crusher, Blake crusher, grizzly, rolls, grinders, Snyder automatic samplers and an ore-sorting belt. From the sorting-belt ore is delivered to 100-ton ore-bunkers, and thence to a 3½-mile aerial tram with half-ton buckets, operated by a 4-h. p. engine for starting, gravity furnishing the motive power, there being a drop of 2,000' between the mine and

the 400-ton ore-bunkers at the lower terminus of the line, on the Esquimalt & Nanaimo railway. From the lower bunkers ore is carried 17 miles, by rail, to the smelter, in 30-ton bottom-dumping cars. Buildings at the mines include an engine-house, boiler-house, smithy, carpenter shop, store, boarding-house and bunk-house, all of wood.

The smelter, at Ladysmith, is well located, having a 45-acre site on Oyster Harbor. A notable feature of these works is the roast-yard. Ores are dumped from the railroad hopper-cars into sixteen 100-ton receiving bins, with hopper-bottoms and screen-tops, latter set at angle of 40°, all fines under $\frac{3}{4}$ " mesh falling into separate compartments built in the center of each bin. The level of the roast-yard is about 8' below the tram-tracks running under the receiving bins. The yard has 6 permanent trestles, 60' apart from center to center, and at right angles to the permanent trestles are 6 trenches, each 4' deep and 40' from center to center. Between the permanent trestles are movable bridges, traveling on wheels, these being trussed so as to clear the roast-heaps below. Both permanent trestles and movable bridges have tram-tracks, with turntables, over which travel side-dumping ore-cars, which thus obtain easy access to every square foot of the roast-yard. Roast-heaps are built up automatically by dumping the tram-cars, each heap averaging 24x50' size on the bottom, by 7' height, and containing an average of 300 tons. Each roast-heap requires an average of 8 cords of wood, and burns about 3 weeks, reducing the sulphur contents to about 5%. The system works perfectly, cinder being reduced to a minimum. When roasted, ore is shoveled into $2\frac{1}{4}$ -ton ore-cars, traveling on tram-lines laid in the bottom of the trenches before mentioned, tops of cars being on a level with bottoms of the roast-heaps. Roasted ore is trammed to the burnt-ore bins, 1,500' distant and just behind the blast-furnace building, there being eighteen 50-ton bins, with central bottom-discharge gates, emptying into tram-cars running over scales to the charging-floor of the furnace. The Tyee roast-yard is the best-planned, taking all things into consideration, of any in existence.

The smelting plant, terraced throughout, to permit handling of material by gravity, has a 56x81' furnace building, of wood, with a 200-ton Allis-Chalmers water-jacket blast-furnace, 42x120" at the tuyeres, using a hot blast, with room for a second furnace of the same size. The furnace has a water-jacket forehearth for matte, slag skimming into a settler and thence into a sluice, where granulated and washed away by running water. The dust-flue, 8x11x165', arched over with corrugated iron, leads to a 90' smoke-stack, of 7' diameter. The furnace reduces 9.45 tons of ore and flux with one ton of coke. The reduction plant also includes a complete sampling mill, briquetting plant for fines, electrolytic assay plant and an electric light plant. The plant also does some custom business, handling ores from British Columbian and Alaskan mines, and sells its product, as a 50% matte, to American smelters having bessemerizing works.

Production, for the calendar year 1905, was 3,039,398 lbs. fine copper, 103,474 oz. fine silver and 5,952 oz. fine gold, as compared with 5,120,870 lbs.

copper, 179,760 oz. silver and 11,088 oz. gold in 1904, the falling off being due to the inability of the mine to furnish as much ore as could be used to advantage. The management is excellent, and it is to be hoped that the work now under way at the mine may lead to the development of larger ore bodies, to replace the partially exhausted reserves.

TYRONE DEVELOPMENT CO.**NEW MEXICO.**

Office: care of Chester A. Congdon, Duluth, Minn. Mine office: Silver City, Grant Co., N. M. A close corporation, organized June, 1906, with capitalization \$300,000, shares \$10 par, by Thomas F. Cole, John D. Clark, James L. Norman, Lee W. Farmer, James Wanless, W. W. Billson and Chester A. Congdon, to develop sundry prospects in the Silver City district.

TZAREVO-ALEXANDROVSKI WORKS.**SIBERIA.**

Office, mine and works: Semipalatinsk, Siberia. Mines are said to be rather promising, though slightly developed, giving an average annual production of circa 500,000 lbs. fine copper.

UBEHEBA COPPER CO.**CALIFORNIA.**

Capitalization \$1,000,000, shares \$1 par. Lands, sundry claims, about 50 miles south of Goldfield, Nevada, in the Ubeheba Mountains, near Death Valley, Inyo county, California, said to show veins of 8' to 50' width, carrying auriferous and argentiferous ores, up to 20% in copper tenor.

UDO MINE.**JAPAN.**

Mine office: Usagi-mura, Hikawa-gori, Isumo, Japan. Ores are chalcopyrite and bornite, accompanied by hematite and limonite, occurring in a vein of 3' to 18' width and 320' length. Was worked extensively, 1870-1881, but present production is trivial, mine being nearly exhausted.

UGURCHAISKA & GALIZURSKI MINES.**RUSSIA.**

Office: care of G. Chaimazidi, manager, Batum, Russia. Kunderov Bros., owners. Mines, in the government of Elizabetopol, are small producers only.

UINTAH COPPER SUMMIT CO.**UTAH.**

Office: 25 Equitable Bldg., Boston, Mass. Mine office: Vernal, Uintah Co., Utah. W. M. Payson, treasurer. Country rock is cherty limestone, carrying pockets of malachite and chalcocite. Property is known as the Dyer mine, and has been idle several years.

UNITAH MINING & MILLING DEVELOPMENT CO.**UTAH.**

Letter returned from former mine office, Bingham Canyon, Salt Lake Co., Utah. L. C. Moore, general manager; F. D. McNeill, superintendent. Is said to have bought the Castro group, opened by a 700' tunnel, at Bingham Canyon, 1905. Apparently is some relation to the Castro-Grecian.

ULCAHOMO MINING & MILLING CO.**WYOMING.**

Office: care of Le Roy Grant, president and general manager, Cheyenne, Wyo. Lands, 11 claims, area 220 acres, 1¼ miles from the Strong Copper Mining Co., in Natrona county, Wyoming, opened by shafts of 35' and 100', and equipped with a small steam plant.

ULIDA GROUP.**CALIFORNIA.**

Office: care of Wm. L. Hunter, owner, Lone Pine, Cal. Lands, 8 claims,

in Inyo county, California, showing contact veins between limestone and granite, carrying auriferous and argentiferous malachite and tetrahedrite, with occasional cuprite. Has made small smelter shipments of hand-sorted high-grade ore. Idle.

UNAWEEP COPPER MINING & MILLING CO.

COLORADO.

Office: care of James V. Howard, secretary, Grand Junction, Colo. Organized under laws of Colorado, with capitalization \$500,000, shares \$1 par. Lands, 6 claims and a millsite, in the Unawep district, slightly developed. Has steam power. Presumably idle.

UNCLE SAM CONSOLIDATED MINING CO.

UTAH.

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver, copper and lead. Has steam power.

UNCLE SAM COPPER CO.

ARIZONA.

Office: 1743 West 25th St., Los Angeles, Cal. Mine office: Gilbert, Yavapai Co., Ariz. Milo Baker, president; W. T. Somes, secretary, treasurer and general manager. Organized July, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 5 patented claims, area circa 100 acres, 12 miles from a railroad, showing several ore bodies, of which one has a 188' shaft, showing a 5' to 6' ore body, giving assays of \$20 to \$40 per ton in copper, gold and silver, mainly from oxidized ores, with some sulphides carrying high values in gold and silver. Idle for several years, but company hopes to resume work, late in 1906.

UNDERLAY MINE.

AUSTRALIA.

Mine office: Dandaloo, New South Wales, Australia. Lands, circa 20 miles west of Dandaloo, adjoin the Mount Royal mine, showing a 5' vein carrying high-grade oxide, carbonate and sulphide ores, ranging up to 40% in copper tenor.

MINAS UNIÓN y CONSTANCIA.

MEXICO.

Office and mines: Indé, Durango, Mexico. Reinaldo E. Avila, general manager. Mines were opened in the Sixteenth Century. Country rock is andesite, showing 9 ore bodies, carrying chalcopyrite, galena and sphalerite, associated with iron pyrites. Ore body under development averages 2 metres width and is opened by a shaft of 18m. and tunnels of 70m. and 100m., developing first-grade ore averaging 43% lead, 100 oz. silver and 54 oz. gold per metric ton, and second-grade ore averaging 4% copper and 20 oz. silver per ton, latter showing a little native copper. Smelter, 4 miles from the mine, has two 30-ton water-jacket blast-furnaces, shipping matte to the Aguascalientes works of the American Smelting & Refining Co., for conversion and refining.

UNION COPPER LAND & MINING CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; James Chynoweth, superintendent; preceding officers, John C. Watson, Rogers L. Barstow and C. D. Coffin, directors; J. Abner Sherman, land agent. Organized 1863, and reincorporated 1893, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued \$2,000,000. Annual meeting,

fourth Thursday in March. Old Colony Trust Co., Boston, registrar. Net expenses for 1905 were \$5,784.17, leaving a cash balance, at end of year, of \$63,723.42.

Lands, circa 200 different parcels, area upward of 7,000 acres, practically all on the mineral belt, in Keweenaw, Houghton, and Ontonagon counties, Michigan, much of the land being covered with valuable timber, including pine, hemlock and hardwood, mainly the latter. One tract of 160 acres is under option to the Erie-Ontario Development Co. The construction of the Keweenaw Central railway will add greatly to the prospective value of the company's holdings on Keweenaw Point.

UNION COPPER MINING CO.

CALIFORNIA.

Office: care of Estate of Fredk. L. Ames, Boston, Mass. Mine office: Copperopolis, Calaveras Co., Cal. David Ross, superintendent. Controlling stock interest is owned by the Ames Estate, Boston. Lands include the Union, Keystone and Empire mines, also 2 claims adjoining the Alto, in Del Norte county, California. Mines, opened 1861, were considerable producers, paying fair dividends, circa 1861-1866. Formation is a black pyritous slate, in amphibolite schists, this belt running from Tuolumne county, on the south, through Calaveras into Amador county, on the north. The vein of pyritous slate is 33' to 40' wide, with strike of 30° East of South and a dip of 30° to the East. Ore occurs as lenses of 15' average width, connected by stringers, main lense being 2' to 40' wide and 600' long. The alteration zone, circa 30' in depth only, carries rich oxides and carbonates, and some native copper, below which occurs chalcopyrite, carrying neither gold nor silver, and unusually free from arsenic, antimony, bismuth and other undesirable elements. So pure is the ore that the blister copper therefrom makes good wire-bars, without electrolytic refining. Ore is classified in two grades, as smelting ore of 10% to 11% copper tenor, and as leaching ore carrying 5% to 5.5% copper. Main shaft, 60', is bottomed in a 15' lense of medium-grade ore, and the mine has a mile of openings in ore. Equipment includes a hoist, pumps, etc., with necessary mine buildings. Has a 100-ton Orford smelter, installed 1889. Operations were confined, for many years, to producing cement copper, by leaching the old dumps, which are extensive. At last accounts smelter had been overhauled, a 90' steel gallows-frame built, the main workings cleaned out and retimbered, and plans laid for an active campaign of production.

UNION COPPER MINING CO.

NORTH CAROLINA.

Office: 52 Broadway, New York. Mine office: Gold Hill, Rowan Co., N. C. Calvin H. Allen, president and treasurer; Temple T. Berdan, secretary; preceding officers, T. C. Buck, Jr., Berlin C. Brown, D. D. Drummond, R. P. Doremus, E. Fletcher, Jr. and H. F. Warren, directors; H. L. Griswold, superintendent. Organized 1899, under laws of New Jersey, with capitalization \$3,000,000, shares \$10 par.

Lands, circa 1,150 acres, about 15 miles from Salisbury, in Rowan and Cabarrus counties, North Carolina, well watered and timbered, showing 3 copper veins and one vein each of copper, gold and silver, with a little work

done on the silver and gold veins. Principal mining development has been on the "Big Cut" copper vein, which has 10 shafts, of 150' to 650' depth, along the strike of the vein for a distance of nearly a mile. The upper levels show an ore body of 20' to 40' width, carrying oxidized ores and a little native copper, ore on the lower levels being chalcopryite, with quartz gangue, in a vein of 8' to 16' width, with slate walls. Mine was claimed to average 10% copper, 3 oz. to 30 oz. silver and \$1.50 to \$7.50 gold per ton, but a careful sampling, by Dr. A. R. LeDoux, gave averages of 4.4% copper, 4 oz. silver and 40 cents to \$1.20 gold per ton. Ore occurs as lenses and chutes, in a mineralized zone, the lenses averaging about 100' in length.

The machinery plant is extensive, but poorly planned, including 27 boilers, 18 hoists, 3 air-compressors and an electric light plant. The property has 4 dams, with storage capacity for 3 months' operations, and a 25,000' sawmill. Buildings include a 45x70' machine shop, 40x60' smithy, iron and brass foundry, concentrator, smelter, sundry engine-houses and boiler-houses, stable for 400 horses and mules, office building, 50-room hotel and 130 dwellings.

The reduction plant includes a concentrator and smelter, latter having roasters and two 40-ton blast-furnaces, blown in September, 1901, and blown out June, 1902.

Company's affairs were badly muddled by the former management, which apparently was interested mainly in the stock-market. The mine has been worked on a small scale since the smelter was blown out, and is sending silicious concentrates, for fluxing, to the Tennessee Copper Co., beginning with shipments of 375 tons in March, and increasing to 1,100 tons in August, 1905, production of the year being estimated at 850,000 lbs. fine copper. The management levied a voluntary assessment March 20, 1906. Property is considered of considerable promise, if extensively developed, given a modern equipment, and worked with a view to mining profits, rather than stock-market profits.

UNION COPPER MINING CO.

WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. Henry C. Hedges, president; A. E. Mosier, secretary. Organized under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 100 acres, 3 miles from Encampment, slightly developed. Has steam power. Property is well regarded. Idle.

UNION COPPER SMELTER CO.

ARIZONA.

A fraud. Same as Union Copper Smelting Co.

UNION COPPER SMELTING CO.

ARIZONA.

A fraud, promoted by the notorious Wm. F. Wernse gang, of St. Louis

UNION DEVELOPMENT CO.

CALIFORNIA.

Letter returned unclaimed from former office, Boston, Mass. Property was the Juanita claim, in the Morrow district, 26 miles east of Johannesburg, San Bernardino county, California, showing a contact vein, between granite and limestone, carrying auriferous chalcopryite, with talcose gangue, opened by 4 shafts, deepest 212'. Idle some years.

UNION ORE EXTRACTION & REDUCTION CO.**COLORADO.**

Reorganized, circa 1905, as National Radium & Copper Co.

UNITED ALKALI CO., LTD.**SPAIN.**

Offices: St. Helens, England. Mine office: Huelva, Spain. Wm. Guthrie Bowie, mine manager. Capitalization, £8,750,000. Has paid 19% on common stock, since 1890. Company is a chemical and manufacturing corporation, with which copper mining is merely a small branch of the general business, and controls 46 subsidiary works and companies, some of great size. Has large works at St. Helens, Runcorn, Flint, Widnes and Glasgow, making extensive use of Spanish and Portuguese pyrites, which are burned for sulphur, the cinder of the cupriforous pyrites being leached for copper.

The principal copper property of the company is the Monte Rubio group held under lease from C. & J. Sundeim, this including the Monte Rubio, Gibraltar and Atbalcal Arbalcal mines, having a combined area of circa 100 hectares, at Paimogo, Huelva, Spain. These are ancient properties, worked only to the level of the nearest stream, in the Roman era, the old workings, though comparatively superficial, disclosing enormous masses of ore, occurring as oxides, carbonates, sulphides and sulphate, with gangue of iron ore, indicating the existence of large bodies of unaltered iron-copper sulphides at greater depth.

The company also leases El Tinto and La Santa Rosa mines, with adjoining properties, area 141 hectares, at Zalamea la Real, Huelva, Spain, from the Sociedad de las Minas de Cobre Tinto y Santa Rosa. Company also has sundry undeveloped mineral leases on the river Guadiana, and has a 22-kilometre railway from Monte Rubio to Coíña Veral, on that river, with wharves for shipping ore to Great Britain. A 9-kilometre Bleichert aerial tram connects the mines with the railway at Calañas. Production, 1904, was 86 long tons of cement copper and 31,394 tons cupriforous pyrites.

UNITED ARIZONA COPPER CO., LTD.**ARIZONA.**

Offices: 38, Broad Street Ave., London, E. C., Eng. Rt. Hon. Earl of Orford, chairman; W. P. Guthridge, mine manager; J. F. Shearer, secretary. Organized Oct. 15, 1902, with capitalization £200,000, shares £1 par; issued, £160,000. Lands, 500 acres, in Pinal county, Arizona, said to have been bought for £160,000 cash, carrying auriferous and argentiferous copper ores. Main shaft, 600', is said to develop considerable ore bodies. Equipment includes a 30-ton smelter, and erection of a 100-ton smelter and leaching plant has been contemplated, for several years, but has not materialized. Ore smelted in the past is said to have averaged 9% copper, with considerable gold and silver values. Management claims that work is in progress. Regarded with suspicion.

UNITED BINGHAM CONSOLIDATED MINING CO.**UTAH.**

Tentative title for proposed consolidation of the United Bingham Gold & Copper Mining Co. and Silver Shield mine.

UNITED BINGHAM GOLD & COPPER MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Louis Moore, president; A. Hanauer, Jr. secretary; Harry Joseph,

superintendent. Lands, several patented claims, partly developed by the Snowstorm tunnel, which has opened a 4' vein assaying 2% copper, 25% lead and up to \$8 gold per ton. Presumably idle.

UNITED BUFA MINES.

MEXICO.

Office: 1 Exchange Place, Jersey City, N. J. Organized 1903, under laws of New Jersey, with capitalization \$300,000, shares \$1 par, to mine copper and other ores in Mexico. Apparently abortive.

UNITED COPPER CO.

ARIZONA.

Presumably dead. Organized Nov. 8, 1899, under laws of Arizona, with capitalization \$50,000. Chas. M. Moore, secretary; Andrew A. Meyer, treasurer.

UNITED COPPER CO.

MONTANA.

Office: 42 Broadway, New York. F. August Heinze, president and general manager; Arthur P. Heinze, vice-president; John MacGinnis second vice-president; preceding officers, Stephen E. Nash, Isaac S. Taylor, Frederick A. Martens, G. Reusens, Otto C. Heinze and Max N. Schultz, directors; Stanley Gifford, secretary and treasurer. Organized April 28, 1902, under laws of New Jersey, with capitalization \$80,000,000, shares \$100 par, in \$5,000,000 preferred 6% cumulative shares and \$75,000,000 common shares, of which all the preferred stock and \$45,000,000 of common stock have been issued. American Loan & Trust Co., Boston, C. S. Buckingham, 42 Broadway, New York and Union Trust Co., New York, transfer agents; Metropolitan Trust Co., New York, Old Colony Trust Co., Boston, and Fidelity Trust Co., Pittsburg, registrars. Annual meeting, first Wednesday in June. Stock is listed on the Boston and Pittsburg stock exchanges.

Preferred stock is redeemable at \$125 per share, in full or any portion thereof, upon any dividend date, by the company giving 3 months' notice, and it is probable that a portion of the preferred stock will be retired November 15, 1906. The board of directors has power to fix, determine and vary the disposition of any surplus, etc., from time to time, the powers of the board being practically absolute.

The company has paid regular 6% dividends on its preferred stock, since organization. First dividend on common stock was paid 1905, the company having paid, to end of 1905, dividends of \$1,500,000, same being \$1,500,000 on the preferred and \$450,000 on the common stock. A second dividend, on the common stock, amounting to \$787,500, was paid January 31, 1906 and a third dividend, of the same amount, was paid April 30, 1906, apparently putting the common stock on a quarterly dividend basis, at the rate of 7% per annum.

The United Copper Co. is a securities holding corporation solely, and is organized along much the same lines as its former great rival, the Amalgamated Copper Co., but owing to the settlement of the war between the Amalgamated and the United Copper interests, in February, 1906, by the selling of the Heinze holdings to the Butte Coalition Mining Co., the status the United Copper Co. has been changed materially. The United Copper Co. began business as the owner of sundry stocks and bonds of various sub-

subsidiary mining and holding corporations, as given in detail in Volume V, but through the selling of practically all of the holdings of these subsidiary companies, in the Butte camp, sundry readjustments have been necessitated. The price paid for the various Heinze holdings in Butte, by the Butte Coalition Mining Co., is said to have been \$14,000,000 cash, but the United Copper Co. is a large shareholder in the Butte Coalition Mining Co., the stock of which has greatly appreciated in value, enhancing the holdings of the United Copper Co. accordingly. By the settlement of all litigation between the United and Amalgamated interests, a serious drain has been stopped, the cost of such litigation, for eight years past, having averaged more than \$1,000,000 yearly. In May, 1906, the stockholders authorized the sale of \$1,000,000 Montana Ore Purchasing Co. bonds and \$2,500,000 Nipper Consolidated Copper Co. bonds, at par, to the Butte Coalition Mining Co. For 1905, the company showed a surplus of \$370,087.

In addition to its holdings in the Butte Coalition Mining Co., the United Copper Co. controls, as subsidiary companies, the Basin Reduction Co., which concentrates the ores of the Butte Coalition Mining Co., and La France Copper Co., which holds the Lexington mine, in Butte, and is a producer therefrom of zinc and copper ores. Production by subsidiary companies, 1905, was 27,081,350 lbs. fine copper, but will be small for 1906, owing to sale of all of the principal mines, in February.

It is probable that the aggressive management of the United Copper Co., which has won its spurs in the field of finance by fighting a drawn battle with the Amalgamated and Standard Oil forces, will not remain content to continue existence merely as a coupon-clipping bureau, and it need not prove surprising if the company be heard from later, as a copper producer from fields other than Butte.

UNITED COPPER CO.

WASHINGTON.

Office: 512-705 First Ave., Seattle, Wash. Mine office: Galena, Kittitas Co., Wash. Edward Peterson, president board of management. Organized under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Lands, 310 acres, also a 60-acre millsite, well timbered, with available water power, on Camp creek, a branch of the Cle Elum river, in the Cle Elum district. Property shows 3 veins, carrying chalcocite and chalcopyrite, the main vein, of 50' to 100' estimated surface width, traceable 4 miles, carrying chalcopyrite, with a parallel vein and a cross vein carrying chalcocite. Development is by circa 1,800' of tunnels, giving ore assaying up to 31% copper and \$5 to \$10 gold per ton.

UNITED COPPER-GOLD MINING & EXTRACTION CO.

ARIZONA.

Still-born. Lands now held by Eagle Copper-Gold Mining & Milling Co.

UNITED COPPER MINING CO.

ARIZONA.

Letter returned unclaimed from former office, 155 La Salle St., Chicago, Ills.

UNITED EMPIRE CO.

BRITISH COLUMBIA.

Office: Bridgeport, Conn. Mine office: Princeton, Similkameen district, B. C. Dr. R. A. Lockhart, president; Wm. C. McDougall, vice-president and Canadian agent; Edwin L. Foster, secretary and treasurer. Organ-

ized 1904, under laws of Arizona with capitalization \$500,000, shares \$1 par. Lands, sundry claims, developed by shafts, a 125' tunnel and numerous open-cuts, for a distance of circa 3,000', on the strike of a vein of 50' width, showing malachite and azurite, near surface. Ore is said to average \$5 to \$6 per ton and could be mined cheaply and in large quantities. The property carries a large bed of limestone, suitable for fluxing. Company is in litigation, original owners claiming a breach of contract, by which the purchasers failed to provide working capital, in the amounts and at the times agreed.

UNITED EXPLORATION CO.

WYOMING.

Office: 113 Devonshire St., Boston, Mass. Supposed to have absorbed the Beulah Copper Co., of Wyoming. Apparently moribund.

UNITED GERMAN COPPER MINES, LTD.

GERMANY.

Dissolved, September, 1904.

UNITED GLOBE MINES.

ARIZONA.

Office: 99 John St., New York. Mine office: Globe, Gila Co., Ariz. James Douglas, president; George Notman, secretary and treasurer; Niles S. Berray, superintendent. Capitalization \$2,300,000, shares \$100 par. A large proportion of the stock issue is held by the Old Dominion Company. Paid a dividend of \$6.50 per share, December 15, 1905.

Lands, 29 claims, lying next west of the Old Dominion group, also 3 millsites. Mine is extensively developed, having a 765' three-compartment main shaft, showing an ore chute of 30' width and 700' length, carrying ore averaging 4% and upwards in copper, on the seventh level. Ore bodies are extensive, but erratic, and highly silicious, requiring heavy fluxing, and the mine is wet. Leasers formerly working on the property produced ores averaging 20% copper and 1 oz. to 15 oz. silver per ton, but the high-grade ore mined by the company averages circa 14% copper.

The mine has a 200-ton smelter, idle for some years, and is operated under a close working agreement with the Old Dominion mine, details of which arrangement are given in the description of the Old Dominion Company. To all practical intents and purpose, the United Globe now is a portion of the Old Dominion mine. Production 1905, is estimated at 7,000,000 lbs. fine copper.

UNITED GOLD & COPPER CO.

NEW MEXICO & CALIFORNIA.

Dead. Letters returned from all former offices. Sold stock and paid dividends simultaneously, with the inevitable result. Fully described—and investors warned—in Vols IV and V.

UNITED GOLD & COPPER MINING CO.

COLORADO & NEW MEXICO.

Dead. Was "regarded with suspicion" in Vol. V. Suspicions fully verified.

UNITED METALS SELLING CO.

NEW YORK.

Office: 42 Broadway, New York. Works office: Perth Amboy, Middlesex Co., N. J. Adolph Lewisohn, president; Henry H. Rogers, vice-president; A. W. Evarts, secretary; Urban H. Broughton, treasurer and general manager; preceding officers, Wm. Rockefeller, Jesse Lewisohn and Frederick P. Olcott, directors. Organized January 29, 1900, under laws of New Jersey, with capitalization \$5,000,000, shares \$100 par. Dividends, since organ-

ization, have been as follows: 15% in 1900; 5% in 1901; 10% in 1902; 10% in 1903; 10% in 1904, and 20% in 1905. Company is controlled by large shareholders of the Amalgamated Copper Co., and is said to be considering an increase of capitalization.

The company does a general commission business in metals, the great bulk of its trade being in copper, of which it is the largest broker in the world, handling fully 600,000,000 pounds of copper yearly. The company is sales agent for the Amalgamated, North Butte, Osceola, Trimountain, Bingham Consolidated, Utah Consolidated, Arizona, Tamarack, and other smaller producers. Company owns and operates the Raritan Copper Works, at Perth Amboy, on New York harbor. This plant, completed 1899, is large and modern, doing a heavy business in refining blister copper electrolytically for the subsidiary companies of the Amalgamated Copper Co., and for various independent companies that sell their product through this agency.

UNITED MEXICAN MINING & SMELTING CO.

Stock in this corporation is being peddled by the notorious "Rev." C. E. Nylin, of the Laborers Co-operative Gold, Silver & Copper Mining Co. Anything that this larcenous minister of the gospel is connected with may be set down safely as a swindle.

UNITED MINES CO.

ARIZONA.

Office: Globe, Gila Co., Ariz. Organized 1904, with capitalization \$5,000,000.

UNITED MINING & DEVELOPMENT CO. OF AMERICA.

CALIFORNIA & MEXICO.

Office: 66 Broadway, New York. John Thompson, president; John R. Stanton, vice-president; Alfred W. Kiddle, secretary; E. F. Phelps, treasurer; Albert F. Freeman, general manager. Capitalization \$10,000,000, shares \$10 par, in \$2,000,000 of 6% preferred and \$8,000,000 common stock. Is a promotion and development company, formed to open and finance mines along much the same lines as the Venture Corporation of London. Holdings include 40 acres, known as the King Solomon mine, at Valley, Calaveras county, California, and the Nevada de las Miches mine, 107 pertenencias, area 264 acres, in the Fuerte district of Sinaloa, Mexico. The California property has about 2,000' of underground openings, giving assays of \$12 to \$15 per ton, in gold and copper. A little development also has been secured on the Sinaloa property.

UNITED RICO MINES CO.

COLORADO.

Office: Denver, Colo. Mine office: Rico, Dolores Co., Colo. T. Walter Beam, president; John L. McNeill, vice-president; J. G. Moffat, second vice-president; Albert B. Roeder, secretary and treasurer; Percy S. Rider, superintendent; preceding officers, Daniel B. Ellis, J. W. Billuly and Thos. Keely, directors. Capitalization \$3,600,000, shares \$1 par, of which practically 75% was given for the stock of subsidiary companies. The United Rico Mines Co. controls, through stock ownership, the following named corporations: Rico Smelting & Refining Co., Colorado Milling & Concentrating Co., Rico Mining & Milling Co., Enterprise Mining Co., Rico-Aspen Mining Co.,

Black Hawk Mining Co., Rico Townsite Mining Co., Atlantic Cable Consolidated Mining Co., Security Mining Co., and several other properties. The various subsidiary companies were capitalized at about \$15,000,000.

Lands, circa 200 claims, area 4,000 acres, including sundry millsites, smelter-sites, water-rights and 10 town lots. The mines have considerable development, collectively, and carry auriferous and argentiferous ores of copper, lead and zinc, greatest values being in the zinc. Equipment includes steam and electric power and a 20-stamp mill with 3 Huntington mills, 100-ton concentrator, 50-ton zinc mill and 100-ton smelter. Management seems good, and property should become a large producer of zinc, making considerable lead, copper, silver and gold, as by-products.

UNITED SOUTH AFRICA ASSOCIATION, LTD.

TRANSVAAL.

Offices: 28, St. Swithin's Lane, London, E. C., Eng. Mine office: Brown's Bldgs., Loveday St., Johannesburg, Transvaal. Lord C. Montagu, chairman; W. Blelock and A. H. Oppenheim, general managers in South Africa; Minnett E. Frames, consulting engineer; D. H. W. Broad, secretary. Organized February 6, 1902, with capitalization £300,000, shares £1 par; issued, £253,100. Paid a 10% dividend, 1903, and a 15% dividend, 1905.

Lands, 568 claims on the Doornkop farm, a half-interest in 1,203 claims on the Klipportje farm, the Hollandia and Diamant Pan farms, and prospecting rights over sundry other farms, with options on 16 farms, area 50,000 morgen, on the border of the Middelburg and Waterburg districts, latter carrying copper in a 250' shaft.

UNITED SPANISH COPPER MINES, LTD.

SPAIN.

Voluntarily wound up, February, 1901.

UNITED STATES GOLD & COPPER CO.

WASHINGTON.

Letter returned unclaimed from former office, Seattle, Wash. Mine office: Chewelah, Stevens Co., Wash. Lands, sundry claims, slightly developed, said to show promising copper ore. Early in 1906 was under bond and lease to George C. Robbins, said to represent eastern capital.

UNITED STATES GOLD INCORPORATION.

COLORADO

Mine office: Eldora, Boulder Co., Colo. John F. Rowell, general manager, at last accounts. Lands, 300 acres, in the Arapahoe copper-gold belt.

UNITED STATES & GUERRERO EXPLORATION CO.

MEXICO.

Office: Ashland, Ky. Dr. J. Letton Martin, president. Capitalization, \$1,000,000. Lands, 148 acres, in the states of Michoacán and Guerrero, Mexico, former holdings being near the Inguarán. Idle.

UNITED STATES & MEXICAN MINING CO.

MEXICO.

Office: 42 Murray St., New York. Mine office: Hostotipaquillo, Jalisco, Mexico. Isaac P. Martin, manager. Lands include the Trinidad and Guadalupe mines, carrying auriferous and argentiferous copper and lead sulphides.

UNITED STATES MINE.

ARIZONA.

Mine office: Globe, Gila Co., Ariz. Adolph Lund, owner. Lands, sundry claims, adjoining Old Dominion, on the west side of Pinal creek, opened by a 100' three-compartment shaft, planned to be sunk to depth of 1,000'.

UNITED STATES MINING CO.**UTAH.**

Offices: 50 Congress St., Boston, Mass. and 508 Dooly Blk., Salt Lake City, Utah. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Tintic, Juab Co., Utah. Employs 1,331 men. Wm. G. Sharp, president; Wm. F. Coolidge, vice-president; F. Winthrop Batchelder, secretary and treasurer; Albert F. Holden, managing director; preceding officers, R. D. Evans, Eugene N. Foss, N. W. Rice, E. C. Swift, J. J. Storrow and Sidney W. Winslow, directors; Hon. C. E. Allen, general manager; A. P. Maybury, mine superintendent at Bingham; R. A. Brown, mine superintendent at Tintic; Richard E. Parker, consulting engineer; Percy Williams, engineer; Aron Hirsch & Sohn, sales agents.

Organized 1899, and reorganized 1901, under laws of Maine, with capitalization \$15,000,000, shares \$25 par; issued, \$14,000,000. Debentures, \$500,000, due May, 1909. Dividends of 50 cents per share were paid July, 1904, and February, 1905. Net earnings for fiscal year ending June 30, 1905, were \$1,092,987. The United States Mining Co. owns the entire capital stock of the United States Smelting Co., owns substantially all of the capital stock of Centennial-Eureka Mining Co., operating mines at Tintic, and owns a $\frac{3}{8}$ interest in the DeLamar copper refinery at Chrome, New Jersey. In turn the United States Smelting Co. is controlled by the United States Smelting, Refining & Mining Co., which, in January, 1906, owned 98% of the stock of the United States Mining Co., obtained through exchange of shares, with a cash bonus. Wm. F. Moller, transfer agent. National Shawmut Bank, Boston, registrar. Annual meeting, in October.

The mines of the company are in two groups, one at Bingham and one at Tintic. The properties at Bingham, which were the original holdings of the company, include the Old Jordan, Telegraph, Niagara, Commercial and adjoining claims. The Niagara, which apparently is of the least importance, is held through a stock interest, and minority stockholders fomented litigation, which was settled favorably to the United States company, November, 1904. The Old Jordan and Telegraph were originally silver mines, opened on a fissure vein of silver-lead ore crossing the big sulphide copper dyke from which the present production is secured. The copper ores are silicious and deficient in iron, requiring heavy fluxing, and range in tenor from 1.5% to 2% copper, with 2 oz. to 5 oz. silver and \$1 to \$2.50 gold per ton. The Old Jordan and Telegraph ores are said to be giving smelter returns of 26 to 28 lbs. copper and \$2 to \$2.50 gold and silver per ton. The deepest workings at Bingham are about 400' only, with about 5 miles of openings on the Old Jordan group, developing a large amount of ore. The Galena mine, now being reopened, is developed to a depth of 235' and produced upwards of \$1,000,000 under previous ownership, the record showing average smelter returns of 20% lead, 25 oz. silver and up to \$10 gold per ton. The aerial tramway, taking the ore from mines to railway, has a capacity of 25 tons per hour. Litigation over the Old Jordan was settled favorably to the company, in 1905.

The Tintic group includes the Centennial-Eureka and Tintic mines, control of the Centennial-Eureka, which was a large dividend-payer in

the past, being held through ownership of all but about 100 shares of the capital stock. The Tintic properties are old mines, producing ore of two grades, the oxides and carbonates carrying high values in gold and silver and ranging from \$10 to \$30 per ton in value. The low-grade copper deposits are of enormous extent, but carry only small gold and silver values. The main shaft, 1,500' deep, shows good values on the bottom level. The Centennial-Eureka was examined, early in 1905, by J. Parke Channing, a conservative and fully competent authority, who found reserves of 600,000 tons of ore, carrying average values of \$11.88 per ton. Several patented claims adjoining the Centennial-Eureka were purchased in 1905.

The various mines of the United States company have about 2,000,000 tons of ore blocked out for stoping, of which about 90% is low-grade, this being sufficient for about 5 years requirements. The mines are well equipped with hoisting and other machinery.

In addition to its metalliferous mines the company owns a large limestone quarry and iron mines, supplying flux, and has coal mines supplying fuel. The coal mines employ 185 men and a coking plant attached employs 55 men. The advantages pertaining to complete ownership of ores, fluxes, fuel and smelter are very great, and place the company in an impregnable position as a producer.

The smelter is operated by the United States Smelting Co., and is described under that title.

Production, for the calendar year 1905, was 15,841,667 lbs. fine copper, and for the year ending Oct. 1, 1905, the smelter produced 14,965,438 lbs. fine copper, 10,200,826 lbs. fine lead, 2,107,956 oz. fine silver and 71,445 oz. fine gold, production being valued at approximately \$5,300,000. Early in 1906 the Centennial-Eureka was producing circa 8,500 tons monthly, and the Bingham mines about 15,000 tons monthly, in addition to which circa 2,500 tons of custom ore were purchased monthly by the United States Smelting Co.

UNITED STATES MINING & SMELTING CO. MEXICO.
Dead. A Henry Voorce Brandenburg promotion. Described in Vol. V.

UNITED STATES & NICARAGUA CO. NICARAGUA.

Office: 345 Fourth Ave., Pittsburg, Pa. R. S. Smith, president; M. K. Salsbury, vice-president; Wm. Rees, secretary and treasurer. Organized Apr. 20, 1903, under laws of Maine, with capitalization \$1,000,000, shares \$100 par. Property is an exclusive government concession for mining, covering the two northern states of Chinandega and Segovia, in the republic of Nicaragua.

UNITED STATES REDUCTION & REFINING CO. COLORADO.

Office: 54 Wall St., New York. Works office: Colorado Springs, El Paso Co., Colo. Chas. L. Tutt, president; Chas. N. MacNeill, first vice-president and manager; Spencer Penrose, secretary and treasurer. Organized May 31, 1901, under laws of New Jersey, with capitalization \$10,000,000, in \$4,000,000 non-cumulative 6% preferred and \$6,000,000 common stock. Debentures, \$3,000,000. In November, 1905, had a sinking fund of \$300,000, for bond redemption, and is supposed to have received \$1,000,000

since, for stock of the Utah Copper Co., sold to the American Smelters Securities Co., which probably will be added to the sinking fund. Regular dividend rate, 1902-1903, was $1\frac{1}{2}$ quarterly on preferred, and 1% quarterly on common stock.

Property includes extensive reduction plants, at Colorado City, Florence and Canyon City, Colorado, treating mainly ores from the Cripple Creek district.
UNITED STATES SMELTING CO.

MEXICO.

Organized under laws of Arizona, with capitalization \$1,000,000, shares 25 cents par. Lands, supposedly circa 30 acres, undeveloped, in the Ures district, Sonora, Mexico. Apparently is merely a stock-jobbing enterprise.
UNITED STATES SMELTING CO.

UTAH.

Offices: 50 Congress St., Boston, Mass., and 508 Dooly Blk., Salt Lake City, Utah. Works office: West Jordan, Salt Lake Co., Utah. General officers are practically the same as those of the United States Mining Co., which owns the entire capital stock of the United States Smelting Co. A. F. Holden, managing director; Hon. C. E. Allen, general manager; S. C. Hazeltine, superintendent; H. C. Bellinger, consulting metallurgist; T. R. Jones, manager custom ore department.

The smelter, occupying a 150-acre site, near the works of the Utah Consolidated and Bingham Consolidated, is 12 miles from Bingham and 80 miles from Tintic, where the mines of the United States Mining Co. are located. The plant includes 2 sampling mills, with a third under construction.

The smelter has a present daily capacity of 1,200 tons of copper ore and 300 tons of lead ore, equipment including six 200-ton water-jacket blast-furnaces for copper, three 100-ton water-jacket blast-furnaces for lead, 10 hand-roasters and one 125-ton reverberatory furnace, with 5 additional roasters building for the lead plant. The lead smelter was built 1904, and probably will be doubled in capacity. Pyritic smelting of raw ore was employed originally, in the copper stacks, but has been abandoned. Flux for the silicious Bingham ores is furnished by an iron mine owned by the United States Mining Co. The copper converter has 2 stands, with electric traveling cranes, and the works include a briquetting plant for fines and flue-dust, silica-mill and an electric light plant. The works do a general custom business, besides smelting ores of the United States Mining Co. Considerable trouble has been caused by smelter fumes, but these have been lessened, and the amount of flue-dust cut down, by sundry changes in the smelting practice.

**UNITED STATES SMELTING,
REFINING & MINING CO.**

UNITED STATES & MEXICO.

Office: 50 Congress St., Boston, Mass. Operating office: 508 Dooly Blk., Salt Lake City, Utah. Wm. G. Sharp, president; F. W. Batchelder, secretary and treasurer; A. F. Holden, managing director; preceding officers, Frederick Ayer, William Barbour, Charles F. Brooker, William H. Coolidge, R. D. Evans, Eugene N. Foss, C. A. Hight, N. W. Rice, Galen L. Stone, James J. Storrow, E. C. Swift, H. H. Wehrane, and Sidney W. Winslow, directors.

Organized January 10, 1906, under laws of Maine, with capitalization \$75,000,000, shares \$50 par, in \$37,500,000 preferred 7% cumulative shares and \$37,500,000 common shares. Quarterly dividends of $1\frac{3}{4}\%$ on the preferred shares are payable January, April, July and October, first dividend having been paid April 15, 1906. City Trust Co., Boston, transfer agent. National Shawmut Bank, Boston, registrar. Annual meeting, in May.

The company sold 150,000 shares of stock at par, \$50, less \$4 paid the underwriting syndicate, and with the proceeds has acquired control of a number of important mining companies, being a securities holding corporation solely, modeled along lines somewhat similar to the Amalgamated Copper Co. and the American Smelting & Refining Co., apparently being planned eventually to become a strong competitor of the latter-named corporation, generally known as the smelter trust.

The United States Smelting, Refining & Mining Co. owns more than 99% of the capital stock of the United States Mining Co., having given therefor share for share, $\frac{3}{4}$ in preferred and $\frac{1}{4}$ in common stock, plus \$1 per share cash bonus. The company also owns upwards of 90% of the capital stock of the Compañía Minera Real del Monte y Pachuca, owning a valuable silver-lead mine in the state of Chihuahua, Mexico. The company controls, through stock ownership, the Eureka-Richmond Mining Co. and the American Exploration Co. The company also controls, either directly or through stock ownership by the United States Mining Co., the Mammoth Copper Mining Co., of California, and also owns a large interest in DeLamar's Copper Refining Co. The various subsidiary companies named are described under their respective titles.

UNITED SULPHUR, COPPER & IRON CO.

Organized August, 1905, under laws of New Jersey, with capitalization \$12,000,000.

UNITED VERDE COPPER CO.

ARIZONA.

Office: 49 Wall St., New York. Mine office: Jerome, Yavapai Co., Ariz. Employs circa 1,100 men. Hon. William A. Clark, president; James A. Macdonald, vice-president; Pierre V. C. Miller, secretary and treasurer; Chas. W. Clark, general manager; preceding officers and James Kitchen, directors; W. L. Clark, assistant superintendent; Otto Strodhoff, chief clerk; Geo. Bosch, master mechanic. Organized September 2, 1899, under laws of West Virginia, with capitalization \$3,000,000, shares \$10 par, as reconstruction of a company of same title, organized under laws of New York. Debentures. \$3,000,000 income bonds authorized; \$2,998,800 issued, payable 1949. Annual meeting, third Monday in February. Is conducted as a close corporation. Senator Clark being supposed to own circa 90% of the capital stock.

Dividend payments were begun, 1892, on the basis of 25 cents per share monthly, increased, 1896, to 50 cents per share monthly, and again increased, 1898, to \$1 per share, monthly, maximum dividends being \$4,498,680, in 1899, in which year the net earnings were \$5,435,970. In 1904 the company paid 7 dividends of 75 cents each, aggregating \$5.25 per share, and in 1905 there were 9 dividends of 75 cents each, aggregating \$6.75 per share.

Lands, 13 claims, area 230 acres, with sundry adjoining lands, in the Verde district of the Black Hills range, at an elevation of 5,600' above sea-level and 1,800' above the valley of the Verde river. The United Verde was a small gold and silver mine, until bought, 1888, by Senator Clark. The mine is in a zone of slates and intrusive dioritic rocks, the neighboring limestone being unconformably superimposed, and apparently having no connection with the ore deposits. The mine is opened on a single monstrous lense of sulphide ore, of 600' extreme width and circa 1,900' length, in slate, the lense having a dip of 72°, and being intruded by a 70' quartzite dyke carrying about 1% copper and 1 oz. to 13 oz. gold per ton, ore from which is used for converter linings. The gossan outcrop, carrying auriferous and argentiferous oxide and carbonate ores, to a depth of circa 160', has been worked out. The zone of secondary enrichment carries mainly chalcocite, with some covellite and other alteration minerals of copper, all highly argentiferous. The unaltered ores, mainly chalcopyrite, with a little bornite, are both auriferous and argentiferous. In mining no assortment is made and no concentration attempted, everything from the mine openings going to the furnaces, the average of the ore taken from the openings being circa 6.5% copper and 15% to 32% sulphur.

Access to the mine is secured with extreme difficulty, and only upon a written order from Senator Clark, such orders being very uncommon, and employees are cautioned against giving out information. Underground openings are very extensive, with enormous ore reserves, estimates of ore in sight varying greatly, and ranging up to 20,000,000 tons, which is much too high. Mine is developed above the 900' level, diamond drill borings showing ore to a depth of 2,000'. It is not known that the ore is leaner at that depth, but in all likelihood such is the case. The mine is worked pillar-and-stall, and timber, when used, is placed as square sets. Worked-out stopes are filled with culls, and occasionally with barren rock blasted from the mountain side above the mine, and milled into the abandoned stopes, a practice regarded as dangerous.

Owing to its richness in sulphur the ore is very heating, and liable to spontaneous combustion, hence a sharp watch is kept for fires, which are extinguished at their inception, when possible, or otherwise walled in by solid concrete bulkheads. Owing to the more or less shattered condition of the lense, it is difficult entirely to prevent access of air, very little of which will keep a fire burning indefinitely in an ore so rich in sulphur as that of the United Verde. The most serious outbreak of fire was in August, 1902, causing a total suspension of mining. The fire was finally gotten under control by pumping the mine full of carbonic acid gas, this being made by treating crushed limestone with dilute sulphuric acid, in iron tanks, gas being forced by natural pressure into the top of the shaft, whence it fell by gravity to the bottom of the mine, displacing the lighter atmospheric air. The fire on the 400' level has been burning since 1897, and although its progress is cut off as much as possible, by bulkheads, has eaten its way, slowly but steadily, to the 700' level, at the bottom of the mine. Fire, however, while dangerous and annoying, cannot burn

up the copper, all of which will be recovered, eventually. The mine is subject to bad caves, one of which carried down the office building and killed a number of employes, some years ago. From a miner's standpoint the United Verde is not an especially desirable working-place, as the openings are very hot and the acid waters cause blisters and sores upon the unprotected skin, while the mine fires and caving ground render underground work more or less dangerous. Efforts have been made to render the mine safer, but, owing to its having been opened wrongly at the start, these are not entirely successful, though considerable improvement has been secured. Owing to the fires and caves, the shafts sunk in ore are subject to drawing, causing their ultimate abandonment, hence all new shafts are sunk in the country rock. The timbering of the mine has been much bettered latterly, and the mine, while by no means an ideal working-place for persons of weak nerves, is much safer than formerly.

In April, 1905, a serious explosion killed 5 men, and for a time threatened the entire mine. The fire had eaten its way to a point below the 700' level, and a cave on this level, caused by the fire, fissured the superincumbent rock-mass so that surface-waters from the heavy spring rains seeped down into the fire zone, generating steam that blew out the solid masonry bulkheads and endangered the lives of the miners by steam and sulphur fumes—a truly diabolical combination. In fact the explosion at the United Verde might be termed an artificial volcano, just as the "air-blasts" at the Quincy and Atlantic mines, in the Lake Superior district, are called artificial earthquakes. The caving ground followed by the explosion caused the surface to settle in May, 1905, but this trouble proved less serious than was first feared, and production was suspended for 48 hours only.

The manner in which the fire is being fought and conquered is very simple, yet highly ingenious, credit for the plan being due to Mr. J. J. Shaw. The Hampton stope, in the fire zone, idle since 1901, is being mined out, with the aid of compressed air. The air feeds the fire, which is a smouldering one, but drives back the deadly fumes and permits the miners to work. This new use for compressed air doubtless will be adopted at other sulphide mines having similar trouble from fire.

The old main shaft, 6x18' in size and 800' deep, has a 700-h. p. hoist, good for 2,000' depth, operating two 3-ton double-deck cages. A new 5-compartment shaft, 900' from the old main shaft, 900' deep, was located to sink continuously in country rock, but cut ore at 600' depth and has held it to the bottom, considerably extending the known ore limits of the mine. The new main shaft has 4 cages, worked in counterbalance. Electric traction is used for underground haulage.

The surface plant and smelter are on top of the mine, the precipitous walls of the cañon rendering such a location obligatory, when the mine was opened. A new compound air-compressor, ordered for 1906 delivery, will have steam cylinders of 28" and 52" diameter, with 48" stroke, and air-cylinders of 26" and 44" diameter, with capacity to compress 6,000 cubic feet of free air per minute to a pressure of 70 lbs. per square inch, at 75 revolutions per min-

ute. Coal was used for fuel, but has been replaced largely by petroleum, the coal being of uncertain supply, as well as inferior in grade. A 178,000-gallon storage tank holds the reserve supply of petroleum. Water is received through pipes, but the supply is somewhat scanty, and the precious fluid is husbanded with care. Water from the mine is leached over scrap-iron, in cementation tanks, near the smelter, and the copper in solution recovered as precipitate. Wood for the roast-heaps is inferior, but costs \$8 per cord, and coke for the smelter costs \$12 to \$15 per ton, and is in rather uncertain supply. Electric light and power are furnished by a dynamo driven by 350-h. p. engine.

All ore above 12% in copper tenor is sent direct to the smelter, the balance being trammed through a 1,300' tunnel, on the 500' level, to the roast-yard, where the ore is heap-roasted with cordwood, on contract, each 500-ton heap requiring 5 to 9 weeks for roasting. When roasted, the ore is trammed back into the mine through the tunnel, and hoisted through the shafts to the smelter, the exceedingly precipitous nature of the ground rendering it impracticable to secure direct connection between the smelter and roast-yard, except through the mine. The smelter was practically rebuilt in 1903, while in blast. Equipment includes one 250-ton and three 500-ton blast furnaces, one of the larger furnaces being kept in reserve as a spare, one reverberatory furnace for smelting flue-dust, fines and ores exceptionally rich in the precious metals, and a small tilting furnace for casting anodes. The converter department has 6 stands and 15 shells, with two 50-ton traveling cranes. The smelter stack has a screen-top, to catch flue-dust, which carries high values in gold and silver. Anodes are shipped for refining mainly to the Waelark Wire Works, at Elizabeth, New Jersey, where the gold and silver are parted, and the copper used principally for drawing into wire.

The United Verde & Pacific railroad, a 28-mile narrow-gauge line, connects the mine with the Santa Fé, Phoenix & Prescott railroad, at Jerome Junction, this line traversing very difficult country. Underground employees work 8-hour shifts, and such as wish it are furnished rooms at \$5 per month, and table board at \$7 per week, in a fine hotel built by Senator Clark.

Production, 1905, was approximately 33,000,000 lbs. fine copper, as against 29,500,000 lbs. in 1904, comparing with the largest production, 43,995,932 lbs., in 1899. Dividends for 1904 and 1905, on a total output of 62,500,000 lbs. fine copper, aggregated \$3,600,000, being nearly, but not quite, 6 cents per pound of copper made. There were heavy outlays for improvements, which, charged direct to operating expenses, raised the cost of production, which probably was nearer 9 cents per pound than 8 cents, for the average of the two years, but the cost should be reduced to 7 cents, or possibly less, with improvements completed and the mine working under normal circumstances. In earlier years, applying contained gold and silver toward reduction of cost of copper, latter has been made for 5 cents per pound, and possibly, in some years, for even less, but these figures of cost do not seem likely to be duplicated in the future. The stories, so long and widely current, that the United Verde makes copper for nothing, the gold and silver values defraying all costs, never were true but are likely to do service in the press

and in the prospectuses of new mining corporations, more anxious for cash than truth, for many years to come. The Unite Verde is one of the largest and richest among mines, but there are other mines making cheaper copper.

UNITED VERDE EXTENSION MINING CO.

ARIZONA.

Mine office: Jerome, Yavapai Co., Ariz. N. L. Amster and S. H. Probert, consulting engineers; B. L. Jones, superintendent, at last accounts. Organized 1894, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par, and apparently was reorganized, circa 1905, under laws of Maine. Lands, 4 claims, area 75 acres, adjoining the United Verde. Early work on the Jerome property proving unsuccessful, the promoter committed suicide, and the company later took over the Red Rock mine, near Providence, Yavapai county, Arizona, which apparently has been lost or disposed of. The company is said to be free from debt, and to plan exploring its Jerome claims by diamond drill.

UNITED VERDE JUNIOR COPPER CO.

ARIZONA.

Disappeared utterly. A mere stock-jobbing scheme, of the 1899 copper boom, promoted by Benj. F. Peach and Edwin Wallace.

UNITED VERDE JUNIOR COPPER MINING CO.

ARIZONA.

Dead. Possibly same as the United Verde Junior Copper Co.

UNITED VERDE SYNDICATE, LTD.

BRITISH COLUMBIA.

Office: care of S. E. Ceperly, Vancouver, B. C. Lands, 6 claims, area 240 acres, 5 miles from the proposed line of the Yukon railroad, 40 miles from Howe Sound, on Fitzsimmons Creek, British Columbia, showing large bodies of heavily mineralized schist, carrying 1.5% to 9% copper and \$2.84 gold per ton, with a little silver. Property cannot be operated to advantage until rail connections are secured.

UNITY COPPER & GOLD MINING CO.

NEW MEXICO.

Mine office: Tres Piedras, Taos Co., N. M. Lands, 12 claims, in the Bromide district, claimed to have considerable development and said to give a fair showing of auriferous chalcopyrite, bornite and tetrahedrite. Idle.

UNIVERSAL COPPER MINING CORPORATION, LTD.

MEXICO.

Offices: 31, Lombard St., London, E. C., Eng. F. Richards, secretary. Organized Dec. 21, 1896, with capitalization £40,000, shares £1 par; issued, £9,476. Said to own interests in Mexico, but location not discovered.

SOCIEDAD MINERA UPOLONGOS.

ARGENTINA.

Presumably wound up. Lands now held by Famatina Development Corporation, Ltd.

UREA MINING CO.

MEXICO.

Letter returned unclaimed from former mine office, Velardeña Dgo., Mex.

UTAH-APEX MINING CO.

UTAH.

Offices: 53 Tremont St., Boston, Mass., and 306 Auerbach Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs circa 50 men. E. R. Hastings, president; Frank A. Schirmer, vice-president; Joseph J. Bedlow, secretary; John W. Horne, treasurer; preceding officers, Chas. A. Morse, Henry R. Bradley, Albert J. Orem and Wm. J. Carlin, directors; Parrington M. McCree, superintendent; Arthur L. Pearce,

consulting engineer. Organized May, 1902, under laws of Maine, with capitalization \$2,500,000, shares \$5 par. The directors have asked the shareholders to authorize a 10-year 5% bond issue of \$500,000, convertible into stock at par, of which \$100,000 is to be used for building a railroad spur and tramway, and the installation of a compressor plant, and balance for working capital and further improvements. Annual meeting, second Tuesday in September. Federal Trust Company, Boston, registrar

Lands, 24 claims, area 162 acres, in Carr Fork, adjoining the Utah Consolidated, location being considered excellent. Property originally was the New York and Copperfield groups, to which the Dana, Petro and Highland Boy-Consolidated groups have been added. These various properties have produced 300,000 tons of ore, including chalcopyrite and lead carbonates and sulphides. Ores carry an excess of iron, giving low smelting charges, because of premium paid for each excess unit of iron, by the Utah smelters. The net average of 86 shipments, made by the present company, gave gross values of circa \$9.50 per ton, averaging 2.5% copper, with fair gold and silver values.

Development is by 3 shafts, with upwards of 4 miles of underground workings, the principal openings being the Andy tunnel, which was showing improved ground, early in 1906, and the Parvenu tunnel, 1,200' long, which eventually will cut the main vein, giving a back of 1,000' to 1,500', and which will be connected with the upper workings, becoming the main working tunnel.

The mines are said to show reserves of about 250,000 tons of 2.5% copper ore, and about 40,000 tons of \$15 lead ore. Production has been hampered, in the past, by the necessity of shipping ore by wagon, over rough mountain roads, but this will be remedied by building a 2,200' aerial tram, with a drop of 700', from the portal of the Andy tunnel to the portal of the Parvenu tunnel, and the construction of a 2,300' railway spur from the mouth of the Parvenu tunnel to the Copper Belt railroad. A 15-drill air-compressor will be installed, and the company plans building a concentrator. If the Parvenu tunnel strikes the ore body, as is reasonably certain, the Utah-Apex should make a good mine.

UTAH & BOSTON COPPER CO.

UTAH.

Dead. Property sold, circa 1902, to pay debts.

UTAH CONSOLIDATED GOLD MINES, LTD.

UTAH.

Reorganized, 1902, as Utah Consolidated Mining Co.

UTAH CONSOLIDATED MINING CO.

UTAH.

Office: 42 Broadway, New York. Mine office: Bingham Canyon, Salt Lake Co., Utah. Works office: Murray, Salt Lake Co., Utah. Urban H. Broughton, president; Adolph Lewisohn, vice-president; T. L. Hermann, second vice-president; preceding officers, James Phillips, Jr. and C. N. King, directors; F. P. Addicks, secretary and treasurer; R. H. Channing Jr., general manager; W. R. Smith, general superintendent; W. M. Johnson, assistant superintendent; N. B. Roscorla, mine superintendent; C. L. Morris, smelter superintendent; Geo. K. Fischer, consulting metallurgist; S. Severin Sorenson, mechanical engineer.

Organized 1903, under laws of New Jersey, with capitalization \$1,500,000, shares \$5 par, as a reconstruction of the Utah Consolidated Gold Mines, Ltd., a British corporation that in turn succeeded the Sevier Gold Mines, Ltd., in October, 1896. Property of the Utah Consolidated Mining Co. is 2,490 shares of the 2,500 shares of capital stock of the Highland Boy Gold Mining Co., of New Jersey, latter corporation holding direct title to the Utah properties. About 20% only of the capital stock is held in Great Britain. Dividends of the present company and its predecessor were \$732,000 in 1901, nothing in 1902, \$900,000 each in 1903 and 1904, and \$1,050,000 in 1905. First semi-annual dividend of 1906 was \$2.50, amounting to \$750,000. For 1905, gross earnings were \$3,478,266, and net earnings were \$1,887,385.

Lands, 239 acres, known as the Highland Boy group, in Carr Fork Gulch, Bingham division of the West Mountain district, about $2\frac{1}{2}$ miles from Bingham Canyon. The ores are sulphides, occurring in chutes running 2% to 13% copper, with average values of \$2.50 to \$3 gold and silver per ton, the average ores carrying about 30% each of iron, silica, and sulphur, rendering them self-fluxing. There are 6 distinct ore bodies, with 3 main ore chutes developed, largest being approximately 220' in extreme width by 340' length, opened to depth of 400'. The Highland Boy is opened by one shaft of 900' and 6 tunnels, extraction being through tunnels, No. 7, the lowest tunnel, being 700' below the crest of the mountain. All tunnels are connected, and ore is milled down to the bottom tunnel for removal, tunnels being 1,000' to 2,500' in length. Ore extraction is by the top slice caving system and square set timbering is used, culls being used for filling. Miners work on contract mainly. The entire underground system smacks strongly of Lake Superior iron ore methods. The chutes apparently are somewhat smaller in the bottom levels, but carry good values and are likely to continue workable to great depth. Ore reserves, at the end of 1905, were estimated at 1,100,000 tons of sulphides, and in addition there are about 300,000 tons of low grade oxidized ores, not taken into account by the management. New mine openings, 1905, were 12,444' and the year was ended with circa 12 miles of underground workings.

Owing to extraction by tunnel, the mining plant is not extensive, but is ample for all requirements, electric power being utilized for traction and other purposes. Ore is carried from the portal of No. 7 tunnel by a 12,700' aerial tram, leading to ore-bins beside the track of the Rio Grande Western railway. There also is a subsidiary aerial tram crossing Carr Fork Cañon, used in handling lumber and mining supplies.

The 500-ton Highland Boy concentrator has 18 Frue vanners, 36 Wilfley tables and 2 Wilfley slimers.

The 800-ton smelter, at Murray, 10 miles south of Salt Lake City and 17 miles north of the mine, has 20 McDougall calciners, 3 Wethey calcining furnaces and 9 reverberatory furnaces, two of the latter being 17'x43' 6". Power is furnished by a 450-h. p. Nordberg tandem-compound steam engine and a 250-kw. Westinghouse electric generator. A dust-chamber, 27x56x18', has steel hopper bottoms, and the converter plant has a 190' stack 5' 6" in diameter. The ores give clean slags, and the plant gives excellent results, turning out 99%

blister copper. Smelting costs are exceptionally low. Considerable trouble has been had with the agricultural interests adjoining, through actual damages caused, and even greater damages claimed, from sulphur fumes. Experiments have been conducted in liquefying the fumes, and it is likely that an acid plant will be added, giving the company an added revenue from a valuable by-product, formerly lost.

Production, 1905, was 287,148 tons of ore, of which 286,363 tons, or practically all, was sulphide copper ore, yielding 17,264,474 lbs. fine copper, 374,685 oz. fine silver and 28,290 oz. fine gold, giving an average yield of 3% copper, 1.3 oz. silver and 0.1 oz. gold per ton. Mining expenses were \$444,331.74, or \$1.55 per ton, and smelting and transportation charges were \$647,996.89, or \$2.25 per ton, while total costs of all kinds aggregated \$1,313,022.75, or \$4.57 per ton. Net cost of copper, 1905, was 7.6 cents per pound. The Utah is a fine mine, with a most excellent management, and is capable of a considerably large output than has yet been secured:

UTAH COPPER CO.

UTAH.

Office: 604 McCornick Bldg., Salt Lake City, Utah.. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 225 men. Chas. M. MacNeill, president; Daniel C. Jackling, vice-president, general manager and chairman executive committee; Spencer Penrose, secretary and treasurer; preceding officers, Col. Enos A. Wall, J. D. Hawkins and Kenneth K. McLaren, directors; Robt. C. Gemmell, general superintendent; John McDonald, mine superintendent; Frank G. Janney, mill superintendent; G. O. Bradley, mechanical engineer; J. C. Dick, mining engineer; John Hays Hammond, consulting engineer.

Organized April 30, 1904, under laws of New Jersey, with capitalization \$4,500,000, shares \$10 par. Has been authorized to increase capitalization to \$6,000,000, the new stock issue of \$1,500,000 par value to remain in the treasury, for redemption of an authorized bond issue of \$3,000,000, at 6%, of which \$800,000 has been issued, in denominations of \$1,000, convertible in 5 years, at option of holder, into stock, at \$20, or twice par. A bond issue of \$750,000 at 7% has been partially retired by the new bonds at 6%, and balance of new bonds will be used for the construction of additional milling facilities. The American Smelters Securities Co. has a large share interest in the Utah Copper Co. Annual meeting, fourth Friday in January. Morton Trust Company, New York, registrar.

Lands, 18 claims, area 200 acres, with 3,000 acres in mill and smelter sites, the mining lands, bought of the DeLamar-Wall Mining & Milling Co., lying on both sides of Bingham Canyon, permitting ore extraction by tunnel, to great depth. Country rocks are porphyry and quartzite, the ore body being monzonite, an altered, decomposed, friable porphyry that breaks easily, yet stands well, giving timbering costs of less than 2 cents per ton of ore-mined. Ore is chalcopyrite, quite evenly disseminated throughout the porphyry, with occasional veinlets carrying high-grade chalcocite and bornite. The porphyritic ore runs 0.75% to 2.75%, and the average assay of 6,000 samples is 1.98% copper, 0.15 oz. silver and

0.016 oz. gold per ton, which is practically identical with the average of the ore milled.

Considerable diamond drilling has been done, from the main tunnel, to depths of 400' to 500', proving a continuance of the ore body, practically unaltered, to those depths. The ore measures of the Utah Copper Co. are a continuation of the monzonite ore body of the Boston Consolidated, which is one of the greatest in the world, there being an area of approximately 2,000x3,000' carrying ore having a known depth of 500', without barren rock yet encountered at any point, by tunnels or bore-holes. The mine has blocked out, above the main tunnel level, about 25,000,000 tons of ore.

Owing to the altogether unusual nature of the ore body, the Utah is essentially a quarrying proposition, like the Rio Tinto and Granby. The plan of development is unique, and is adaptable only to a property of this most unusual nature. Mine openings are rectangular, laid out like the streets of a city, with blocks above blocks, like the successive floors of a building. There are 13 tunnels, entering the hills at approximately right angles to the gulch. These tunnels are avenues, and crossing the avenues, at right angles, parallel with the gulch, are streets, these being opened 150' apart. Parallelizing the tunnels, or avenues, are drifts, corresponding to alleys in the cities, these being 75' from the avenues, on either side. The tunnels are 10x10', or larger, and all openings are of exceptionally large dimensions. connections between the various floors being secured by upraises from alley to alley. The avenues, streets and alleys are named on the same system as is used in the street nomenclature of Salt Lake City. In all, 12 miles of avenues, streets and alleys had been opened, to the end of 1905.

The main working tunnel has a double tram-track, laid with 30-lb. rails. Stope levels are opened at intervals of 17' and 25'. The mine is to be operated by the caving system, and also by open-pit work, and a steam shovel was bought, early in 1906.

The mine has a 125-h. p. steam plant, air-compressor, 18 power drills and an electric haulage system.

The first concentrator, of 1,000 tons daily capacity, costing about \$300,000, was so planned that it could be increased, by units, to circa 6,000 tons, ultimately. Development at the mine rendering it probable that this capacity would be insufficient, a new mill-site has been secured, of sufficient size to permit unlimited development. The first concentrator, in Bingham Canyon, near the mine and 1½ miles below Bingham, receives ore over a spur of the Bingham branch of the Rio Grande railway, the railroad track entering the mill over a trestle, ore being dumped into bins beneath the track. The building is 193x327' in size, built of wood and sheathed with iron. Equipment includes 2 Gates centrifugal crushers, 4 sets of rolls, 6 Hartz jigs, 32 Wilfley tables, 2 Overstrom tables, 2 Card tables, 52 slime tables, 6 Chilean mills, 18 six-foot Frue vanners, 6 hydraulic classifiers, 6 revolving screens, and settlers. Ore is drawn from the bins, through chutes, to a 200' belt-conveyor, which carries the ore to the crushers. The crushing department, 28x44', has two 1,200-ton Gates crushers, and two sets of 36" and 30" Gates

rolls. The boiler house, 36x100', has eight 75-h. p. tubular boilers, with automatic stokers, and 125-h. p., 150-h. p. and 350-h. p. engines.

The new mill is located on a 3,000-acre millsite, near Garfield Beach, Saltair, Great Salt Lake, the site being 10 miles north of Bingham, and 4 miles from the new Garfield smelter of the American Smelting & Refining Co. The Saltair property has several good springs, one with a flow of 3,000 gallons per minute, giving water supply adequate for a 3,000-ton mill, and additional water supply can be developed.

The new concentrator is being built in units of 3,000 tons capacity each, of steel throughout. The first unit, now under construction, is 300x505' in size, and steel has been ordered for the second unit, the contract calling for delivery of material September, 1906. The first unit will be in operation late in 1906, or early in 1907 and the second unit probably will be nearly a year later in completion. The two units, with their outlying buildings and yards, will cover about 20 acres, and it is planned eventually to add 2 other units, giving 12,000 tons daily capacity, which will exceed, by 2,000 tons, the full capacity of the reduction works of either the Anaconda or Calumet & Hecla, at present the two largest mills possessed by any mines.

The machinery plant for the new concentrator is to be of 3,000 h. p. capacity. The new plant includes a 50x105' machine shop, with steel frame and brick walls. The new concentrator will be served by an 8-mile branch of the Rio Grande railway.

The nature of the ore, which is very evenly disseminated chalcopryite, necessitates fine crushing, causing considerable sliming. The new mill is expected to recover 25 to 30 pounds fine copper per ton of ore treated, putting 18 to 23 tons into 1, giving concentrates averaging 26% to 30% copper, with \$6 to \$10 combined gold and silver values per ton. Tailings of the old mill carry 0.5% to 0.75% copper, which is too much, and doubtless will be reduced.

At no point on the globe are there developments of greater importance, or that are likely to have a more profound and far-reaching effect upon the future of the copper industry. It is not beyond the bounds of possibility that the Utah Copper Co. is the pioneer in solving the question of the world's future copper supply—a question that has been given much serious consideration during the past few years, by the largest consumers of the metal. The mining work of the Utah Copper Co. is an evolution, yet it may prove to be the beginning of a revolution also.

Heretofore the world's supply of copper has come from native copper and from nature's concentrated deposits of copper ore. The Utah people have gone to the original repository of the metals—the rock magma from which, by cunning processes of leaching, precipitation and concentration, Dame Nature has brought the disseminated chalcopryite up to deposits of workable grade. The porphyry worked by this company undoubtedly has been enriched, to a considerable extent, since expelled from a vent in the earth's crust, aeons ago, yet the mine must be regarded as a step in advance of anything heretofore accomplished in mining. The mine of the Utah Copper Co. is not opened on a vein, lense or stockwerk, but upon the original magma whence have come all

our mineral values. The Utah has gone down to the backbone of nature, for its ores, and the success of the company, which is not open to question, opens a new and vast field of possibilities in the mining world.

The Utah Copper Co. has, so far as known, the largest ore body of any metal ever opened, at any time, in any part of the world. Its ore body, so far as proven by openings and the drill, contains fully 250,000,000 tons of ore, carrying approximately five millions tons of fine copper, one hundred and twenty-five million ounces of silver and seven million five hundred thousand ounces of gold, metals worth, at 15 cents per pound for copper and 60 cents per ounce for silver, about seventy-five millions of dollars for the silver, one hundred and fifty millions of dollars for the gold, and fifteen hundred millions of dollars for the copper, which should be produced at an ultimate profit of one hundred and fifty millions to two hundred and fifty millions of dollars.

At the end of 1905 the old mill was treating about 650 tons of ore daily, planned to be increased, a little later, to an average of 1,000 tons daily. The old mill is said to have shown earnings as high as \$1.50 per ton, which should be greater, with the new plant running, at the same price for copper. With the new mill in operation, the company should be able to mine by steam-shovel, at 30 cents per ton, with a freight rate of 30 cents to Garfield, an estimated average cost of 75 cents per ton for milling, and 15 cents for smelting charges in reverberatories, and miscellaneous charges of 25 cents to 35 cents per ton, giving a total cost of \$1.75 to \$1.85 per ton of raw ore treated.

There seems some basis for the complaint of Col. Wall, who is persona non grata with the management, that the ore is slimed extensively, and too large a proportion of the values lost, but the ore is of such a nature that considerable sliming seems unavoidable. Col. Wall is mistaken, however, in condemning the use of the steam-shovel.

Production, 1904, was 3,898,490 lbs. fine copper, and for 1905 was 5,473,469 lbs. fine copper, and for 1906 should be between 6,000,000 and 7,000,000 lbs. fine copper. With two units of the plant completed, and the old 1,000-ton mill in operation, the property should have a productive capacity of circa 65,000,000 lbs. fine copper yearly, after the completion of the second unit of the new mill. The property, beyond question, is one of the future great copper mines of the globe.

UTAH DEVELOPMENT CO.

UTAH.

Office: Salt Lake City, Utah. Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Organized 1905, with capitalization \$3,000,000, shares \$5 par, as successor of New Red Wing Mining Co., giving 1 share of Utah Development for 3 shares of New Red Wing. Company is said also to have secured control of the Butler-Liberal Consolidated Mining Co. The Red Wing mine has a 5' vein carrying a 3' paystreak assaying up to 23.2% copper, 12% lead, 60 oz. silver and 0.04 oz. gold per ton, opened by 3 tunnels, No. 3 tunnel, of circa 700' length, being claimed to show a 50' vein of milling ore, carrying values mainly in lead and silver.

UTAH & EASTERN COPPER CO.

UTAH.

Offices: 127 Church St., New Haven, Conn. and Salt Lake City, Utah. Mine office: Dixie, Washington Co., Utah. Works office: Shem, Washington Co., Utah. Louis E. Stoddard, president; Chas. E. Graham, vice-president; T. W. Farnam, secretary and treasurer; Chas. H. Doolittle, general manager. Organized February, 1901, under laws of West Virginia, with capitalization \$1,500,000, shares \$5 par.

Lands, 11 patented claims, area 220 acres, also a 40-acre smelter-site, mining lands including the old Dixie mine, in the Tutsagubet or Cave Springs district, near Green river. Property shows 5 fissure veins, in limestone, one, of 40' estimated average width, carrying cuprite, azurite and massive malachite, giving average assays of 15% copper. Principal development was by a 775' blind shaft, sunk from the breast of a 225' tunnel, but the shaft caved, June 1, 1905, and it was necessary to run a new tunnel of 800', to reopen the mine. Old workings were said to show about 100,000 tons of ore. The mine uses gasoline power.

The old 25-ton smelter, poorly located, is idle. The new smelter, at Shem, has a 100-ton water-jacket blast-furnace. Power for blower is secured from the Santa Clara river, circa 2 miles distant, and an auxiliary steam plant is being added, to provide against shortage in water-power. The company has built a 50-mile road, with a down-grade haul, between the smelter and Acoma, on the Rio Grande Western, the nearest railroad point, and will use a traction engine for transport.

Owing to the trouble at the mine, production for 1905 was only 400,166 lbs. fine copper, as against 1,448,597 lbs. in 1904, but the 1906 production should be much larger. The property is hampered by lack of rail connections, but is undoubtedly valuable, and has a good management.

UTAH-NEVADA COPPER CO.

UTAH.

Office: 801 Equitable Bldg., Denver, Colo. Mine office: Elgin, Grand Co., Utah. John P. Brockway, president; Dr. W. F. Temple, vice-president; Wm. M. Ingersoll, secretary and treasurer; E. P. Wolverton, general manager; preceding officers and N. T. Plummer, directors. Organized January 9, 1905, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. International Trust Co., Denver, registrar.

Lands, 45 claims, area 900 acres, also seven 5-acre millsites, in the Keg Springs district of Emery county, Utah, and 1,220 acres of hydro-carbon deposits, in the eastern end of Wayne county, Utah, giving total holdings of 2,215 acres. The Keg Springs lands show sundry fissure veins and contact veins between limestone and porphyry, carrying melaconite and chalcocite, assaying up to 70% copper, 30 oz. to 50 oz. silver and \$5 to \$15 gold per ton. Development is exclusively by open-cuts, company estimating that 200,000 tons of second-grade ore, worth \$50 to \$70 per ton, is exposed thereby, which seems excessive. Mill tests of second-grade ore gave a concentration of 6 into 1, ore treated assaying 18.8% copper, 4 oz. silver and 2 oz. gold, which would give concentrates of the exceptional richness of 112.8% copper, in addition to gold and silver values, unless a considerable

portion of the copper were lost, which probably was the case. Ores of such grade never require concentration. Transportation, as planned by the company, will be by barge and tug, on Green river, from a point about 7 miles below the mines, to the Rio Grande railway, giving a river haul of circa 50 miles.

Owing to serious dissensions, and complaints about the handling of the company's affairs, the management was taken away from Wm. F. Kendrick and associates, after work had been suspended for some time because the latter furnished no funds. The company planned beginning shipments circa May 1, 1906. Property is considered promising, but present management claims too much on the strength of very limited development.

UTAH-NEVADA GOLD & COPPER MINING CO.

UTAH.

Office: care of David Jensen, vice-president, Ogden, Utah. J. Stanley Dee, president; W. D. Pyper, treasurer; I. C. Dallimore, secretary; Thos. Cunningham, superintendent. Organized 1903, with capitalization \$500,000, shares \$1 par. Lands, 6 claims, in the Newfoundland district of Box Elder and Weber counties, Utah, opened by sundry open-cuts, and by shafts of 50' and 70', showing 2 veins of 3' to 5' width, carrying chalcopryite with pyrite and quartz gangue, assaying up to 32% copper, 17 oz. silver and \$12 gold per ton.

UTAH QUEEN MINE.

UTAH.

Letter returned unclaimed from former mine office, Bingham Canyon, Utah.

UTAH SMELTING CO.

UTAH.

Office: care of Bela Kadish, general manager, Ogden, Utah. Mine office: Bonneville, Box Elder Co., Utah. David Eccles, president; Chas. Nibley, secretary; John Pingill, treasurer. Capitalization, \$500,000. In May, 1906, company was excavating for the foundation of a sampling mill and 200-ton custom smelter, planned to be operated by electric power from the municipal plant at Brigham, 12 miles distant. Company is driving artesian wells, and the works are to have a spur-line of the Oregon Short Line railway, from Hot Springs.

UTAH SOUTHERN GOLD & COPPER MINING CO.

UTAH.

Letter returned unclaimed from former office, 25 Broad St., New York. Felix Gottschalk, president; H. A. Crosby, secretary and treasurer. Organized April 10, 1903, under laws of Utah, with capitalization \$500,000, shares \$1 par: issued, \$408,750. Lands, sundry claims, in the Beaver Lake district of Beaver county Utah.

UTICA MINING & MILLING CO.

COLORADO.

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Ward, Boulder Co., Colo. G. A. Davison, superintendent, at last accounts. Ores carry gold, silver and copper. Has water power and a 20-stamp mill.

VAL CASTRUCCIO MINES.

ITALY.

Mine office: Massa Marittima, Grosseto, Italy.

VAL D'ELSA COPPER CO., LTD.

ITALY.

Letter returned unclaimed from former office, Glasgow, Scotland.

VALDEZ, COPPER RIVER & YUKON RAILWAY CO.**ALASKA.**

A stock-jobbing proposition, put out by L. E. Pike & Co., of 294 Washington St., Boston, Mass., notorious promoters of swindling "mining" stocks.

ELIDORO VALENCIA.**PERÚ.**

Mine office: Quichin, Camaña, Perú. Is a small copper producer.

VALENCIA COPPER MINING CO.**CALIFORNIA.**

Office: Hayward Bldg., San Francisco, Cal. Letter returned unclaimed from former mine office, Sherwood, Trinity Co., Cal. Chas. E. Laumeister, president; J. E. Manning, secretary and treasurer; F. P. Burris, superintendent. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 12 copper claims, area 248 acres, also 3 quartz-gold claims, area 60 acres, and 240 acres of placer-gold claims, all well watered and timbered, on the East Fork of New River, near the summit of the Trinity-Salmon range, with extensive water-rights, including two falls of 150' each. The copper claims carry a heavy gossan capping and are slightly developed by 2 tunnels. Idle for several years.

SOCIADAD VALENCIANO-ANDALUZA DE ALTOS**SPAIN.****HORNOS y MINAS DE PEÑAFLO.**

Office: Glorieta, 1, Valencia, Spain. Mine office: Peñaflo, Sevilla, Spain. Don Baldomero Deu, president and agent. Capitalization 1,500,000 pesetas, shares 250 pesetas par. Property is the Elvira mine and extensions, carrying copper and iron pyrites, at Peñaflo, and a group of claims, area 144 hectares, at Pueblo de los Infantes, Sevilla. The Peñaflo group was under development, at last accounts.

VALENTINE COPPER & GOLD MINING CO.**UTAH.**

Office: care of J. W. Cairns, president and manager, Salt Lake City, Utah. Letter returned unclaimed from former mine office, Bingham Canyon, Salt Lake Co., Utah. Organized 1904, with capitalization, \$150,000. Made several small shipments of high-grade ore to local smelters, in 1904, and is said to have a vein carrying a 2' paystreak of excellent ore. Idle.

VALENSUELLA COPPER CO.**ARIZONA.**

Office: 3543 W. 23d Ave., Denver, Colo. Mine office: Quartzite, Yuma Co., Ariz. Employs 25 men. Col. Richard Darling, president and general manager; F. W. Deidesheimer, treasurer; Geo. C. Foulkes, secretary. Organized November, 1901, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. Lands, 7 claims, patented, area circa 100 acres, also a 60-acre mill and smelter site, 12 miles southwest of Quartzite, 70 miles from the Southern Pacific railroad and 15 miles from a steamer landing on the Colorado river, supplies being received by water. Country rocks are limestone and schist, carrying 2 contact veins, of fair size, developed by shafts of 200' and 270', with about a quarter mile of workings, showing malachite, azurite and oxide ores, giving average assays of 12% copper, 4 oz. silver and \$4 gold per ton. Has gasoline power, with 2 hoists, good for depth of 500' each, 2 engine-houses, a smithy of 18x24' size, and 6 dwellings.

At last accounts, late in 1905, company was installing a 30-ton Vulcan

water-jacket blast-furnace, which it was planned to blow in, circa June, 1906. Water for the smelter has been secured by a 1,000' artesian well.

VALEO MINING CO.**UTAH.**

Office: care of Hon. Thomas Kearns, general manager, Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. J. P. Boyle, superintendent. Ores carry gold, silver and copper. Has steam power and employed about 25 men, at last accounts.

VALERIE MINE.**YUKON.**

Mine office: White Horse, Yukon, Canada. Shipped 50 tons high-grade chalcopryite, 1903, to the Crofton smelter. Requires a local smelter, or adequate transportation facilities, to become a regular producer.

MINA VALLENARINA.**CHILE.**

Office and mine: Taltal, Antofagasta, Chile. Pedro Herrera, owner and manager. Employed circa 25 men, at last accounts.

VALLEY MINING CO.**COLORADO.**

Office: care of Chas. S. Magowan, president, Iowa City, Ia. Mine office: West Cliff, Custer Co., Colo. John I. Christie, secretary; Sam. E. Palmer, general manager; Harry Triplett, mine superintendent; Frank L. Card, mill superintendent. Organized under laws of Colorado, with capitalization \$150,000, shares \$1 par. Lands, 6 patented claims, area 72 acres, also a 20-acre millsite, in the Silver Cliff district, with 6 veins of 2" to 2' width, opened by shafts of 175' and 280', with 1,300' of workings, showing ore giving average assays of 2.5% copper, 17% lead, 1% zinc, 10 oz. to 13 oz. silver and \$4 gold per ton, from oxidized ores, with occasional native copper. Has a 75-h. p. steam plant at mine, with 2 hoists and an air-compressor, and a 60-ton concentrator, 50x175', of brick and wood, having a 150-h. p. steam plant, 18" Blake crusher, 2 trains of rolls, 6 Card concentrating tables, 2 sizers and 500' of canvas slime-tables.

VALLEY VIEW MINING CO.**CALIFORNIA.**

Office: San Francisco, Cal. Mine office: Lincoln, Placer Co., Cal. Lands, 90 acres, patented, showing impregnations 250' wide, with circa 25' of ore, between schistose walls. Has a gossan outcrop, nearly 110' wide and 1,000' long, carrying average gold and silver values of about \$4 per ton. Ore shipped averages about 5% copper. Has two 5' Huntington mills.

VALLEY VIEW MINING CO.**MONTANA.**

Letter returned unclaimed from former mine office, Anaconda, Mont.

VALRUBIO GROUP.**SPAIN.**

Offices: care of M. Yglesias, owner, 2 Tokenhouse Bldgs., London, E. C. Eng. Mine office: Paimogo, Huelva, Spain. Property includes the Valrubio, San Carlos and San Andres mines, with total area of circa 200 acres, lying between the Romanera and Monterubio groups, and carrying the western extensions of the San Vicente veins.

VAL VERDE COPPER CO., LTD.**ARIZONA.**

Insolvent. Fully described in Vol IV.

VAN ANDA COPPER & GOLD MINES CO., LTD.**BRITISH COLUMBIA.**

Dead.

VAN ANDA MINES & SMELTER.**BRITISH COLUMBIA.**

Dead. Property was the Cornell and Copper Queen mines.

VANCOUVER & BOUNDARY CREEK**BRITISH COLUMBIA.****DEVELOPMENT & MINING CO.**

Mine office: Penticton, Yale district, B. C. C. Vacher, manager. Ores carry gold, silver and copper. Has steam power. Idle.

VANCOUVER ISLAND MINING &**BRITISH COLUMBIA.****DEVELOPMENT CO., LTD.**

Offices: 45, Leadenhall St., London, E. C., Eng. Mine office: Duncan, Vancouver Island, B. C. F. H. Faviell, chairman; Clemont Livingston, general manager; J. I. Fifield, secretary. Organized November 18, 1902. with capitalization £50,000, shares £1 par; issued, £27,420. Is said to plan an increase of capitalization.

Lands, circa 1,800 acres, east of the Esquimalt & Nanaimo railway, mostly lying east of the Tye and supposedly carrying the eastern extension of the Tye copper formation. Principal development is on the Westholm claim, having a 510' two-compartment working shaft, with about $\frac{1}{2}$ mile of openings, showing some ore of 3% to 10% copper tenor, drifts on the 500' level showing a wide mineralized zone, with occasional concentrations of copper, but no ore body of commercial size has been discovered as yet. The Westholm shaft is 700' west of known occurrence of ore at the Tye. Management is excellent, and property is considered well located.

COMPAÑIA FERROVARRIA VASCO-CASTELLANA.**SPAIN.**

Office: Madrid, Spain. Mine office: Burgos, Burgos, Spain. Property is the Mina de Peneda, undergoing development at last accounts.

VEILED PROPHET COPPER CO., LTD.**ARIZONA.**

Office: 27 William St., New York. Mine office: Clifton, Graham Co. Ariz. Ben M. Crawford, general manager. Capitalization \$500,000, shares \$1 par. Lands, 5 claims, area 100 acres, near the Shannon, Standard and New England & Clifton mines, developed by open-cuts and short tunnels, showing high-grade surface ores, giving assays of 16% to 20% copper, and concentrating ores giving assays of 4% to 8% copper, with an average of about 6 oz. silver and \$4 gold per ton. Idle.

VELARDEÑA MINING & SMELTING CO.**MEXICO.**

Office: 71 Broadway, New York. Mine and works office: Velardeña, Durango, Mexico. D. M. Haynes, superintendent; M. Dahlgren, mine superintendent; Wm. Daly, smelter superintendent. Is controlled, through ownership of 60% of capital stock, by American Smelters Securities Co.

Lands, 2,500 pertenencias, area 6,177 acres, including a number of mines, of which the Terneres and Santa Maria silver-lead mines and the Copper Queen mine, carrying argentiferous copper ores, are the more developed, and are the principal producers. The mines are said to have upwards of 800,000 tons of ore blocked out, including considerable lead ore, the mines carrying much lead, though opened originally for copper. The reduction plant is at Velardeña, on the line of the Mexican International railway, 24 miles from the mines, and connected therewith by the Ferrocarril Velardeña. The

200-ton concentrator is to be increased to 500 tons daily capacity. The old smelter is idle, having been replaced by a new smelter of 1,000 tons daily capacity, which it was planned to blow in circa July, 1906. It is planned to double the capacity of this smelter, to 2,000 tons, rendering it the largest custom smelter in Mexico. The plant is well arranged, handling of material being automatic throughout, as far as possible, the works having been designed to handle low grade copper and lead ores, with a maximum of economy. An ore-bedding plant is to be installed, permitting systematic mixing of ores before charging. A 1,200-h. p. central steam plant is planned, to generate electricity for the mines and smelter. The property is considered promising, and is under an experienced and fully capable management.

VELVET-PORTLAND MINE, LTD.**BRITISH COLUMBIA.**

Reorganized, Nov. 18, 1905, as New Velvet Portland Mine, Ltd.

VELVET (ROSSLAND) MINE, LTD.**BRITISH COLUMBIA.**

Merged, January, 1904, in Velvet-Portland Mine, Ltd.

VENICE COPPER CO.**MEXICO.**

Office: Venice, Ill. Letter returned unclaimed from former mine office, Soyopa, Sonora, Mexico. Lands supposedly sold to Calumet & Yaqui River Copper Co.

VENTURA COLORADO COPPER MINING & SMELTING CO.

Incorporated, 1903, under laws of Colorado, by D. H. De Arman, et al.

VENTURE HILL MINING CO.**ARIZONA.**

Office and mines: Jerome, Yavapai Co., Ariz. Thos. E. Campbell, president and general manager; Geo. H. Avery, vice-president and superintendent; Chas. F. Avery, secretary; Frank E. Jordan, treasurer. Organized 1900, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 6 patented claims, area 110 acres, in the Verde district, showing 2 fissure veins, claimed by company to average 90' width and to carry average values of 4.7% copper, 6.5 oz. silver and \$4 gold per ton, in oxide and sulphide ores, developed by shafts of 65' and 87', and tunnels of 205' and 457'. Presumably idle.

VERDE APEX COPPER CO.**WYOMING.**

Supposed to have had copper claims somewhere in Wyoming

VERDE APEX COPPER MINING CO.**ARIZONA.**

Office: care of Chas. B. Lutz, president Bloomsburg, Pa. Mine office: Jerome, Yavapai Co., Ariz. F. E. Jordan, agent. Organized 1900, with capitalization \$3,000,000, shares \$1 par. Lands 6 claims, area circa 90 acres, in Mescal Gulch, about one mile south of Jerome, slightly opened by shaft and tunnel. Out of funds and may lose lands.

VERDE CHIEF COPPER MINING CO.**ARIZONA.**

Office: 20 Broad St., New York. Mine office: Jerome, Yavapai Co. Ariz. Chas. L. Tompkins, president; Dr. W. E. Delabarre, vice-president; Frank K. Kohler, secretary and treasurer; R. H. Smith, assistant secretary and treasurer. Organized June, 29, 1900, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Annual meeting, first Monday in July.

Lands, 13 claims, 3 patented, area 260 acres, in the Verde district, 7 miles south of Jerome, including the Carrigan & Gadette group, in Mescal Gulch, adjoining the Cleopatra, and 3 patented claims, known as the Paragon group, purchased recently. The Carrigan & Gadette group has circa 1,700' of workings, showing auriferous and argentiferous sulphides. Work is to be concentrated on the Paragon group, which has tunnels of 135', 150' and 1,066' length, the 150' tunnel showing ore. New management plans testing property thoroughly by diamond drill, before resumption of mining.

VERDE CONSOLIDATED COPPER CO.**ARIZONA.**

Office: Prescott, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Jacob Marks, president; T. E. Campbell, secretary and treasurer. Capitalization 1,500,000, shares \$1 par. Idle.

VERDE GRANDE COPPER CO.**MEXICO.**

Office: 308 North 6th St., Louis, Mo. Mine office: Apartado 98, Hermosillo, Sonora, Mexico. C. P. West, president; R. D. Wood, treasurer; Thomas Tyson, secretary; Jairus D. Fresh, general manager; Jas. Penman, superintendent. Organized 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$5 par. Lands, 500 acres, in the Ures district, circa 40 miles northwest of Hermosillo, partly timbered with ironwood, cottonwood and mesquite. Main tract of 460 acres includes La Verde, La Verde Grande, La Cobriza and San Luis groups, claimed to show veins of 10' to 100' width, largest veins being lowest in grade. The Verde Grande group shows deposits in limestone, near eruptive rocks, giving ores assaying 6% copper, 6 oz. silver and \$1 gold per ton. La Verde and La Cobriza groups shows a contact vein, between granite and quartzite, claimed to be of 30' to 60' width and traceable 7,000', carrying argentiferous and auriferous ore, assaying 5.5% to 16% copper, with gangue of talcose limestone, interstratified with granite and quartz. Mine is developed by 6 different shafts and tunnels, with nearly one mile of workings, claimed to show 200,000 tons of ore.

The smelter, 1½ miles from the principal mine openings, has a 100-ton Allis-Chalmers water-jacket blast-furnace, completed 1904, but idle, company claiming that coke was too expensive, hence the management has installed a 30-ton Medbury furnace, and claims to have ordered 2 more of the same size. This furnace burns charcoal, made from ironwood and mesquite, claimed to cost \$16, Mexican, per ton. Management reported, April 24, 1906, that "on account of the exceeding hardness of the charcoal, and in order to reduce the speed necessary of the pulverizer, they would add additional machinery which would considerably reduce the power at present required to run the machinery, and thereby lessen the expense of refining the ore." This explanation is so luminously self-explanatory that only the exceedingly dense will find it difficult to form an opinion as to exactly what is the trouble with this company, and its management. A leaching plant was being installed, in 1904, but nothing has been heard of the same recently.

The company is supposed to be considerably in debt, to sundry large shareholders, who advanced funds to keep the property going. The adver-

tising of this company has been utterly untruthful, and the methods of operation seem to have been vacillating and inefficient.

VERDE KING COPPER CO.

ARIZONA.

Office: 401 Henne Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Jerome, Yavapai Co., Ariz. Chas. J. George, president; Baron W. Riley, secretary; Joseph Gray, superintendent. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 20 patented claims, adjoining the Cleopatra, said to have circa 3,000' of workings, including a 200' two-compartment shaft. A crosscut from a long tunnel exposed 16' of low-grade ore, carrying copper, silver and gold values, but the tunnel was abandoned. Lands are considered well located, but the repeated excuses of the management, for the idleness of the property, are regarded as decidedly thin.

VERDE MINE.

CALIFORNIA.

Letter returned unclaimed from former mine office, Redding, Shasta Co., Cal. Is a group of 12 idle claims, adjoining the Shasta King group of the Trinity Copper Co., opened by a 600' crosscut tunnel, showing a small vein of good copper ore.

VERDE MINING & MILLING CO.

WYOMING.

Office: 523 Bee Bldg., Omaha, Neb. Letter returned unclaimed from former mine office, Battle, Carbon Co., Wyo. C. M. Jacques, president; J. E. Thacher, secretary and treasurer; G. F. Hinton, general manager; preceding officers, G. H. Lyons and A. H. Crow, directors. Lands, 4 claims, area 80 acres, showing a 35' fissure vein, carrying malachite, bornite and chalcopryite, giving assays of 5% to 21% copper, 6 oz. silver and \$5 gold per ton, opened by shafts of 40' and 115'. Has a 40-h. p. steam plant. Idle for several years.

VERDE QUEEN COPPER CO. OF ARIZONA.

ARIZONA.

Letters returned unclaimed from all former offices. Lands were 28 claims, with a 40-ton smelter, near Jerome, Yavapai county, Arizona. Lands were not sold to the United Verde, in 1904, as was asserted.

VERDI MINE.

MONTANA.

Mine office: Hamilton, Ravalli Co., Mont. J. C. Carter, superintendent. Lands, 5 claims, said to show ore assaying 26% copper, with a trace of gold.

FRANCISCO VERGARA I.

CHILE.

Office and mine: Petorca, Aconcagua, Chile. Owns and operates the Mauro mine, opened 1860, making matte equivalent to about 225,000 lbs. fine copper yearly.

VERMONT & ARIZONA COPPER CO.

ARIZONA.

Office: 150 College St., Burlington, Vt. Mine office: Tombstone, Cochise Co., Ariz. Hon. Hamilton S. Peck, president; J. H. McLoud, secretary and treasurer; J. A. Collier, superintendent. Organized 1899, under laws of Arizona, with capitalization \$1,500,000, shares \$5 par. Lands, 11 claims, area 230 acres, 4 miles from from Gleeson, on the western slope of the Dragoon Mountains, in the Turquoise district, showing 2 gold and silver veins and several copper veins, latter giving assays of 23% to 43% from selected carbonate

ores, opened by a 230' main shaft, with 1,500' of underground workings, and also having about 1,000' of development on 10 adjoining claims. Has steam power and is developing in a small way.

VERMONT & BOSTON MINING CO.**VERMONT.**

Presumably dead. Letters returned unclaimed from former office and former mine office.

VERONICA COPPER MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized Apr. 27, 1906, under laws of Montana, with capitalization \$150,000, shares \$2.50 par.

AKTIESELSKABET VESTERDALENS KOBBERGRUBER.**NORWAY.**

Office: Melderstein, Sweden. Mine office: Næverfjord, Norway. Henning Nordlund, chairman; August Siljeström, superintendent. Organized 1903, under laws of Norway. Employed circa 60 men, at last accounts.

VETA GRANDE MINING CO.**MEXICO.**

Mine office: Bacoachi, Arizpe, Sonora, Mexico. Employs 50 men. James Finch, president; James Hooper, superintendent. Capitalization, \$1,000,000. Lands, sundry claims, 10 miles south of Bacoachi, opened by a tunnel and a 250' three-compartment shaft, showing a 56' vein, carrying auriferous and argentiferous copper ores, assaying \$40 to \$9,000 per ton, with values mainly in silver. Is developing vigorously, and is considered promising.

VETA RICA SILVER & COPPER MINING CO.**MEXICO.**

Mine office: Charcas, San Luis Potosí, Mex. C. H. Hoffman, manager. Has steam power. Presumably idle.

VETERAN-ELY COPPER CO.**NEVADA.**

Mine office: Ely, White Pine Co., Nev. Is controlled by practically the same management and owners as the Cumberland-Ely. Organized, circa January, 1906, under laws of Maine. Lands, 15 claims, adjoining the Giroux Consolidated.

VICKERY-THOMPSON MINING CO.**MEXICO.**

Office and mine: Ocotlán, Oaxaca, Mexico. Guillermo W. Thompson, manager. Lands include properties in the Ocotlán, Tlacolula, Villa Alta and Ixtlán districts of Oaxaca. Apparently has some connection with Compañía Minera Zapoteca. The interest of Frank A. Vickery in this company is said to have been sold, 1905, to G. W. Thompson.

VICTOR BONANZA MINING CO.**CALIFORNIA.**

Office: care of M. T. Dooling, president, Hollister, Cal. Letter returned unclaimed from former mine office, Dos Palos, Merced Co., Cal.

VICTOR CONSOLIDATED MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. Vivian McCune, general manager; J. Treloar, superintendent. Lands include the Victor, Boss Tweed and other mines, carrying gold, silver and copper ores. Has steam power.

GEWERKSCHAFT VICTORIA BLEIERZ- UND**GERMANY.****ZINKBLENDE GRUBEN.**

Office: Köln, Germany. Mine office: Nassau a/L., Rheinprovinz, Germany. Lands, 370 hectares, carrying silver, lead, zinc and copper ores.

VICTORIA BOULDER MINING CO.**COLORADO.**

Mine office: Salina, Boulder Co., Colo. M. B. McClure, manager, at last accounts. Ores carry gold, silver and copper. Has steam power.

VICTORIA COPPER CO.**AUSTRALIA.**

Reorganized repeatedly. Now the African & Australian Co., Ltd.

VICTORIA COPPER MINING CO.**MICHIGAN.**

Office: 539-53 State St., Boston, Mass. Mine office: Victoria, Ontonagon Co., Mich. Employs 100 men. Fred H. Williams, president; Chas. D. Hanchette, vice-president; James P. Graves, secretary and treasurer; preceding officers, Wm. F. Humphrey and Calvin Austin, directors; Geo. Hooper, superintendent; Con. Bedell, mill superintendent; C. R. Forbes, engineer; Henry N. Greely, auditor; C. R. Everett, clerk. Organized Jan. 16, 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; paid in, \$12. Last assessment, \$1, August, 1905. Statement, as of date January 1, 1906, gave assets, exclusive of mine and equipment, of \$73,692, with liabilities, being a balance due former shareholders, of only \$639.33. First National Bank, Boston, registrar. Shares are listed on the Boston Stock Exchange. Annual meeting, fourth Monday in February.

Lands, 2,289 acres, in Sections 19, 20, 29, 30 and 31, Town 50 North, Range 39 West, and Sections 24, 25 and 36, T. 50 N., R. 40 W., in Ontonagon county, Michigan, giving a tract with an extreme width of two miles east and west, and an extreme length, north and south, of $2\frac{3}{4}$ miles, lying just west of the Ontonagon river, practically all on the mineral belt, only about 100 acres lying on the Eastern Sandstone. Neighboring mines, all idle for many years, are the West Minnesota on the north, National on the east and Devon on the west. Nearest active property is the Michigan, three miles northeast. Litigation over a 40% undivided interest in 320 acres of land, in the main mine tract, was settled, favorably to the company, September, 1905.

The first attempt at Lake Superior copper mining, in historic times, was made on the Victoria property, in the winter of 1770-1771. The next mining done was in 1849, when the property was opened, under the name of Cushin, on a line of prehistoric pits containing masses of native copper, one weighing upwards of a ton. Name was changed, 1850, to Forest mine, and property was reorganized, 1858, as the Victoria Mining Co. Under these titles the property made 186 tons, 1,279 lbs. fine copper, at a loss of about \$180,000. The first stamp-mill was burned by a forest fire, and the second was swept away by a flood. The property was operated regularly, on a small scale, 1849-1855, and thereafter spasmodically. The mine was unwatered in 1881, but remained idle until 1899.

The mine is located on a high and steep hill, notwithstanding which the solid rock is covered with heavy sand and clay drift. The Forest amygdaloid lode, on which the mine is developed, is 5' to 30' wide, where opened, very irregular in width, rolling in dip and bunched in contents, with a strike of circa N. 69° E., and average dip of 61° to the northwest, the strike giving about $1\frac{1}{2}$ miles of outcrop on Victoria lands. The Forest bed evidently is one of the cupriferous amygdaloids of the Evergreen belt, opened to the

northeast by the Mass and Adventure, but which one of the series is uncertain.

Work was begun March 1, 1899 under great disadvantages. The old mine had four shafts, numbered from east to west, opened erratically, with shafts and levels at various intervals, lifts being opened at distances of 55' to 65'. Old No. 2, chosen for the main working shaft, was cut down to two-compartment size, 8x12' inside measurement, and in cutting this shaft down from the adit to the third level, considerable barrel work and good stamp-rock was found in what was the footwall of the old mine. No. 2 is 2,089' deep, with levels below the fourth opened at intervals of 100'. The formation is much disturbed near the surface and the lode is irregular in dip, but with the widening noted at depth, better defined walls are found also, as well as a considerable increase in copper, showing some good stoping ground from the seventh level downward, until near the bottom, where the lode widens to about 80', with only occasional bunches of copper. Nineteen levels have been opened and the mine has 26,803' of underground openings.

Old No. 1 shaft, 240' east of No. 2, is 188' deep; old No. 3, 1,190' west of No. 2, is 350' deep and No. 4 is 180' deep. In addition to productive openings, on the Forest lode, the mine has about 3,000' of crosscuts, showing sundry cupriferous beds, but none of promise equal to the Forest. The footwall crosscuts show an amygdaloid underlying the Forest at an average depth of only 6', this bed being well mineralized for 4' to 5' along the footwall, producing small masses up to 50 lbs. weight, the copper occurring mainly on the foot, with considerable epidote on the hanging wall. Underlying this epidotal bed, at a distance of circa 60', is a 6' amygdaloid, showing much epidote and allied minerals, and a little stamp rock. An amygdaloid called the Glenn was opened in 1900, giving a fair showing of copper at the bottom of a shallow shaft. Diamond drill borings north of the mine have shown nothing of special promise.

The Forest amygdaloid is low in grade, but quite regular in contents, showing a little heavy copper, but with values mainly in medium-grade stamp rock. All levels down to the 18th are connected by winzes, giving ventilation and safety. The ground stands well and the mine is without a stick of timber, except in the shafts. Nearly 500,000 tons of stamp rock have been developed, and a considerable stock-pile has been accumulated on surface, from opening work. The copper chute at the Victoria rakes to the southwest, and the best ground below the 15th level will be found in the southwestern drifts. Little mining work has been done since July, 1904, the management thinking enough ground opened for a mill, and devoting money and work to developing a water power and building a mill.

No. 2 has a frame rock-shafthouse 34x40' on the ground and 90' high, with a 16x36' wing. The power-house is 36x40', with a 24x28' wing, of wood, on stone foundations, with steel roof. The hoist, of Webster, Camp & Lane make, is a duplex cylinder engine, with a single drum of 11' face with 12' maximum and 8' minimum diameter, set on a concrete foundation bedded on solid rock. Equipment includes two 12-drill Rand air-compressors and 20 power drills. The old Nordberg hoist at No. 2, with 12x28" cylinders and drum

of 5' diameter and 6' 9" face, is available for use at No. 3 shaft. This hoist, rated at 1,200' capacity only, was used in sinking No. 2 to its full depth of 2,089'.

Buildings at the mine include a 30x60' machine-shop, of wood, with iron roof, a 24x72' carpenter shop and warehouse, a two-story frame boarding-house and office, 27x64', with 10x37' ell, a 19x41' frame schoolhouse, stone changing-house, general store and 58 dwellings. A 10x16x28' storage cistern holds water from the mine for feeding boilers, and water for domestic uses and fire protection is pumped, by a steel windmill, from a well having a storage tank and 750' of water mains. There is a sawmill, with 56" circular saw, furnishing timber and lumber for the mine's requirements. Nearest railroad is the Chicago, Milwaukee & St. Paul, at Rockland, 3 miles distant. The company's lands are well timbered and contain an inexhaustible supply of good building stone.

A large water power has been developed from Glenn Falls, on the west branch of the Ontonagon river, about 1 mile from the mine, at a cost of \$200,000. This is the best natural water power of the Lake Superior copper district, the stream dropping nearly 150' in 1½ miles, by a series of small falls, between which are numerous rapids, with sandstone bottoms. Power is developed by means of a dam, canal and shaft. The dam, built up from excavations in bedrock, is 320' between abutments, and has 32 eighteen-inch "I" beams, 10' apart, sunk vertically 5' to 10' in bedrock, with cement filling. The dam has an extreme height of 24', with width of 14' at the bottom and 8' at the top, and has a 320' main section, with wings of 100' and 160', giving a total length of 580', built with an arch up-stream, giving great strength. The dam is faced, on the water side, with 5x10' plates of 3-16" steel, bolted to the steel "I" beams through the concrete. The center of the dam has an apron 80' wide, also a floating boom to guide logs, as the stream is used for logging operations, the dam being substantially built, so that it cannot be torn out by a log-jam. The outlet is a 44" steel pipe, leading from the bottom of the dam to the power canal.

The canal diverting water from the dam is nearly 6,000' in length, running for about 2,000' through sandstone and 4,000' through alluvium. The canal is 25' wide at the top, 16' wide at the bottom and 16' deep. The outlet of the canal has 6 gates, in two sets, separated by a heavy concrete abutment. The gateways are made of 20" "I" beams, set vertically 6' apart, with 6 gates of heavy oak planking, worked vertically by rack and pinion, actuated by water power. The canal leads, from the foredam, to three vertical intake shafts, 19' from center to center, each 5' in diameter and 334' 6" deep, lined with concrete. The shafts were sunk through solid sandstone, by means of 5" holes bored to the required depth, after which the 5" holes were enlarged to 5' holes, by reaming with a special bit having 4 cutting arms, each 30" in length, actuated by a No. 9 Rand drill.

Air is drawn into the shafts through five thousand tubes of three-eighths inch diameter, and is carried downward, as bubbles, by the falling water. At the bottom of the three shafts is a tunnel of 360' length, leading to a large fan-shaped air-compression chamber, 26' in height, 18' wide at the entrance

of the tunnel and 60' wide at the extreme end, lined with boiler-plate. The imprisoned air, pulled down the shafts by suction and swept along the tunnel in bubbles by the rushing waters, is released, in the compression chamber, and the constant accession of fresh air-bubbles, in myriads of millions, causes compression, the air being held from escaping backward by the superior pressure of the falling water. The plant was designed for an air pressure of 123 lbs. per square inch, and when this pressure is exceeded, the air forces the water in the chamber below the mouth of a 12" vent-pipe, leading to surface. When, in operation, the pressure exceeds 123 lbs. per inch, which it does speedily when the power is not used, the air rushes upward through three hundred feet of pipe with tremendous force, carrying along with it, in revenge, some of the water which pulled it down, throwing a fine spray hundreds of feet in the air, with a roar that gives the listener some faint idea of the terrific combat of the elements that continues ceaselessly, three hundred feet beneath, where man's cunning has harnessed together those warring elements of air and water, forcing each to coerce the other, and yield their reluctant energy to the pygmy who has entrapped them.

The outflow shaft, which would be called a tail-race if on surface, is sunk at an angle of 80° and leads to the lower river. This novel hydraulic-pneumatic power plant was completed in May, 1906, and worked exactly as designed, giving an available energy of 4,000 horse power, rendering it much the most powerful single unit air-compressor in existence, and being the fifth installation of its sort in the world. It is possible to operate one, two or three of the inlet shafts, as may be desired, with corresponding variation of the energy developed.

The simplicity and economy of the Victoria power plant lie in its being absolutely automatic. No machinery is required, the power being drawn off by a pipe, from the compression chamber. Not a pound of waste or a gallon of oil will be required for the operation of the plant. Its simplicity is perfect—turn a cock, and get the power, as easily as town-dwellers draw water from a faucet. It seems as near an approach to perpetual motion as the Twentieth Century is likely to evolve.

The mine and mill are connected by a 4,800' tramline, in two sections, the upper having a grade of 6% and the lower a grade of 12%. A stationary hoist at the top of the incline will serve as a starter, loaded cars bring back empties. A retarding engine might be made to develop power from the tram-line, were it not that the Victoria already has all the power it can use, delivered practically free, except for the interest on the cost of the installation. The tram-line enters the mill over a 700' trestle.

The mill, near the hydraulic works, is 50x150' in size, of wood, with one 12x16" Cuyahoga stamp and 28 Hartz jigs. Foundations of mill and machinery are on concrete beds capping solid sandstone, machinery being anchored by eye-bolts cemented into the rock. The stamp, and part of the washing machinery and shafting, were bought from the old mill of the Belt mine.

The Victoria has been managed with great prudence and economy, and, by reason of its water power, has exceedingly cheap operating costs. The

mine is not rich, but it has the advantage of a skillful and economical management, and last, but not least, has absolutely the cheapest power possessed by any mine on the globe.

VICTORIA COPPER MINING CO.

UTAH.

Mine office: Ashley, Uintah Co., Utah. Idle at last accounts.

VICTORIA GOLD & COPPER MINING CO., LTD. **BRITISH COLUMBIA.**

Office: English Point, B. C. Mine office: Rossland, Yale district, B. C. Frank E. Starkey, president and general manager; Albert G. Starkey, secretary and treasurer. Capitalization \$1,000,000, shares \$1 par. Lands, 200 acres, lying west of Rossland.

VICTORIA MINE.

ONTARIO.

Owned by Mond Nickel Co., Ltd.

VICTOR MINING & SMELTING CO.

MEXICO.

Office: Nogales, Ariz. Mine office: La Cananea, Arizpe, Sonora, Mexico. Louis J. Haas, president; W. H. Paul, vice-president; Frank P. Jackson, secretary and treasurer. Organized May, 9, 1905, under laws of Arizona, with capitalization \$1,000,000, shares \$10 par. Lands, sundry claims, circa 18 miles north of La Cananea, said to show copper ore.

FELIX VICUÑA.

CHILE.

Office and mines: Barco, Higuera, Serena, Chile. Operates La Higuera mine, opened 1855, producing 800 to 1,000 tons of fine copper yearly. Also owns the Solitaria mine, 130' deep, opened 1893, the Panchita mine, 350' deep, opened 1850, and the San Ramón mine, 270' deep, opened 1851, three last named mines being idle, at last accounts.

SANTIAGO VICUÑA.

CHILE.

Office and mine: Huasco, Freirina, Atacama, Chile. Operates Los Astilleros mine, at Huasco, which made circa 500 metric tons of Chile bars yearly, at last accounts, and El Jirio mine, opened 1896, said to produce about 1,000 metric tons of bars yearly.

VIELLA COPPER CO., LTD.

SPAIN.

Compulsorily wound up, February, 1903.

VIGSNES KOBBERVAERKS AKTIEBOLAG.

NORWAY.

Office: Talbodgaden, 8B, Christiania, Norway. Mines include the Vigsnes and Stavanger, sometimes known as the Meraker mines, in the Røros district, south of Trondhjem, Norway. Deepest shaft is 2,389'. Were long the principal producers of Norway, and made 960 long tons fine copper in 1895, but since idle.

VILLAGE BELLE GOLD & COPPER CO.

COLORADO.

Supposedly has lands in Routt county, Colorado.

VINCENNES-ARIZONA COPPER CO.

ARIZONA.

Office: care of Gates M. Fowler, manager, Phoenix, Ariz. Letter returned unclaimed from alleged mine office, Kelvin, Pinal Co., Ariz. Had a working bond and lease on the Wood-Sower group, near Winkelman, which shows a heavy gossan capping, carrying occasional oxide and carbonate ores, with gold values of \$2 to \$5 per ton.

VINDICATOR GOLD & COPPER MINING CO.**UTAH.**

Letter returned unclaimed from former office, Ogden, Utah, and former mine office, Uintah, Weber Co., Utah. Geo. F. Busch, president; Sam T. Myers, secretary. Capitalization \$1,000,000, shares \$1 par. Lands, sundry claims, slightly prospected, near Uintah.

VIOLA GOLD & COPPER MINING CO.**WASHINGTON.**

Office: care of E. M. Kinnear, president, Spokane, Wash. Mine office: Loomis, Okanogan Co., Wash. A. J. Squires, vice-president; T. W. Brown, secretary and general manager; Arthur W. Lindsay, treasurer; preceding officers and Joseph Coleman, directors. Lands, 7 claims, area 140 acres, in the Galena district, on the southern slope of Aeneas Mountain, showing a quartz-porphry dike, carrying ores giving good assay values in copper, lead, silver and gold.

MINA VIRGINIA.**CHILE.**

Mine office: Chafaral, Atacama, Chile. Manuel Hidalgo, owner; Fernando Hernandez, manager. Employed circa 75 men, at last accounts.

VIRGINIA BELLE GOLD & COPPER MINING CO.**ARIZONA.**

Dead. Lost lands, 1906, to Arizona Belle Mining Co.

VIRGINIA CONSOLIDATED COPPER CO.**MARYLAND & VIRGINIA.**

Office: 618 Walnut St., McKeesport, Pa. Mine offices: Libertytown, Frederick Co., Md., and Stony Man, Page Co., Va. Employs 20 men. W. Harry Hamilton president; J. H. Lohman, vice-president; T. A. Robertson, secretary; George B. Humick, treasurer; Thos. A. Dunshee, general manager; C. C. Cramer, mill superintendent. Organized October 15, 1901, under laws of New Jersey with capitalization \$1,000,000, shares \$1 par; issued, \$515,000. Lands are in 2 groups, in Maryland and Virginia, with total holdings of 1,070 acres.

The Liberty mine, in Frederick county, Maryland, area apparently 850 acres, held under a 20-year bond and lease, is an old property, long idle, showing 2 ore bodies, reported by company as deposits in limestone, apparently opened to depth of 90', ore showing melaconite, malachite, chalcocite, bornite and tetrahedrite, with values mainly in bornite, giving average assays of 2.16% copper, 4.7 oz. silver and \$1.80 gold per ton. Property is estimated by management to show 50,000 tons of ore. Mine was closed down, 1860, on account of the American Civil War and was reopened, 1876, for a short time only.

The Virginia tract, 220 acres, freehold, is on Hoak Mountain, showing 3 parallel veins traversing trap and quartzite, one of which, opened by a 320' shaft, with 950' of underground workings, is said to average 12' width and to give average assays of circa 6% copper, 4 oz. silver and \$1.80 gold per ton, mainly from carbonate ores, with occasional occurrence of native copper. Equipment includes a gasoline hoist and a 3-drill air-compressor.

Equipment of the Liberty mine includes a 65-h. p. steam plant, with a hoist good for 1,000' and a small Sullivan air-compressor. Buildings include a 16x28' machine-shop, 20x28' carpenter shop, 2 small smithies, office and 5 dwellings. The concentrator at the Maryland property is 20x40', of wood,

equipped with 3 Sturtevant centrifugal crushers, 3 Wilfley tables and a sizer, and is of 60 tons estimated daily capacity.

The company plans reopening the old Liberty mine which caved in, hence it will be necessary to sink a crosscut beneath the broken ground.
VIRGINIA COPPER CO., LTD. **VIRGINIA.**

Offices: 136 Liberty St., New York, and 95, Gresham St., London, E. C., Eng. Mine office: Highhill, Halifax Co., Va. Commodore P. Vedder, president; F. M. Davis, vice-president; Jas. B. Van Woert, secretary; Richard Lamb, general manager; Evan Davies, superintendent. Organized August 31, 1900, under laws of United Kingdom, with capitalization £300,000, shares £1 par. Lands, 1,617 acres, including the High Hill mine, in the Virgilina district, developed by 8 shafts of 140' to 300' depth, with about one mile of underground openings. Property shows 2 veins, giving assays up to 5.9% copper, 2 oz. silver and 80c. gold per ton, from highly silicious ores. Has a 350-h. p. steam plant and concentrator. Idle.

VIRGINIA COPPER MINING & SMELTING CO.

ARIZONA.

Mine office: Casa Grande, Pinal Co., Ariz. W. P. Guthridge, superintendent. Property is the Reward mine, carrying argentiferous copper ore. Has steam power and a 30-ton water-jacket furnace. Presumably idle.
VIRGIN MINE. **ARIZONA.**

Office and mine: care of Wm. Baker, owner, Dewey, Yavapai Co., Ariz.
MINA LA VIUDA. **CHILE.**

Mine office: Caldera, Atacama, Chile. Said to be a considerable producer of copper.

VIVANDIERE CONSOLIDATED MINING & SMELTING CO. **COLORADO.**

Mine office: Turret, Chaffee Co., Colo. J. J. New, superintendent. Lands, 5 claims, opened by a 615' shaft, showing ore of concentrating grade. Mine has a steam plant, with hoist and air-compressor, and a 50-ton mill, equipped with a crusher, Elspass mill and concentrating tables. Mine is said to have been leased, 1906, for 5 years, to a Leadville syndicate.

VOLCANIC COPPER MINING & SMELTING CO.

CALIFORNIA.

Dead. Former office, 256 South Broadway, Los Angeles, Cal.

VOLCANIC MINE.

BRITISH COLUMBIA.

Mine office: Grand Forks, Boundary District, B. C. Lands, 102 acres, on the north fork of the Kettle river, showing a vein claimed to be 600' wide, carrying cupriferous pyrites, opened by an 800' tunnel. Was under bond to the Volcanic Mining, Smelting & Development Co., but was not taken over, because the finances of the property were misrepresented. Property is considered promising, though low in grade, because of large size of its ore body.

VOLCANIC MINING, SMELTING &

BRITISH COLUMBIA.

DEVELOPMENT CO.

Out of business. Property not taken over, because misrepresented.
VON GERNET COPPER, LTD. **CHILE.**

Liquidated, October, 1905.

J. D. VORIS COPPER MINING CO.

COLORADO.

Mine office: Hillside, Fremont Co., Colo. Presumably idle.

MINA VUELTA FALSA.**SPAIN.**

Office: care of Miguel Yglesias, owner, 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: Paimago, Huelva, Spain. Group includes the Front-eriza and other mines, near the Chanza river, which separates Spain and Portugal. Property shows a vein of about 20' width, giving good assay values in copper, and circa 46% sulphur. Idle, except for a few men making cement copper from the mine waters.

VULCAN CONSOLIDATED COPPER CO.**NEVADA.**

Reorganized as, or succeeded by, Siegel Consolidated Mining Co.

VULCAN COPPER CO.**OREGON.**

Letter returned unclaimed from former office, San Francisco, Cal. Mine office: Takilma, Josephine Co., Ore. Bought the property of the Mountain View Copper Co., for \$24,000. Mine is said to show a promising vein of bornite. Equipment includes a 30-ton Vulcan smelter, never blown in. Idle.

VULCAN COPPER MINING CO.**WYOMING.**

Office: Wausau, Wis. Mine office: Encampment, Carbon Co., Wyo. W. M. Monroe, president; W. D. Kolloch, secretary; F. J. Lordier, superintendent. Organized 1898, with capitalization \$1,000,000, shares \$1 par. Lands, 120 acres, in the Encampment and Battle Lake districts. Has 3 shafts, deepest about 100', showing a 15' sulphide ore vein. Idle several years.

VULCAN COPPER MINING & SMELTING CO.**NEVADA.**

Reorganized, 1901, as Vulcan Consolidated Copper Co.

VULCAN MINING CO.**MICHIGAN.**

Wound up. Lands sold, 1905, to Keweenaw Copper Co.

WABASH MINING CO.**CALIFORNIA.**

Letter returned unclaimed from former office, Los Angeles, Cal. Mine office: Letcher, Fresno Co., Cal. Dr. J. H. Bryant, president. Lands, 16 claims, adjoining the Copper King, opened by 2 shallow shafts, and tunnels of 300' and 400'. Has a steam plant and air compressor. Idle.

WABASH MINING CO.**UTAH.**

Office: 521 Atlas Blk., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Employs 28 men. Nicholas Treweek, president and general manager; James R. Barnes, vice-president; W. Mott Ferris, secretary and treasurer; preceding officers, John M. Dougherty and William Hatfield, directors; D. M. Gillett, superintendent. Reorganized February, 1906, with capitalization \$2,000,000, shares \$5 par.

Lands, 320 acres, including 180 acres held under bonds aggregating \$82,000, on which \$11,000 was paid, November, 1905. Development is by an 800' main shaft, and Sept. 1, 1905, the mine had 5,597' of workings. Property shows 5 veins, of which 3 are considered promising, carrying mainly silver and lead values, with a little copper and gold. Has a steam plant.

WAGNER-GREEN MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Pearl, Colo.

WAHITA COPPER MINING CO.**MICHIGAN.**

Fraudulent. Name changed to Erie Cons. Mining & Reduction Co.

WAHSATCH MINING CO.**UTAH.**

Office: 2206 Lincoln Ave., Ogden, Utah. Mine office: Brigham City, Box Elder Co., Utah. H. C. Baker, president and general manager; J. W. Abbott, vice-president; H. C. Wadleigh, secretary. Organized April, 1904, under laws of Arizona, with capitalization \$1,500,000, shares \$5 par, stock issue being divided into 5% cumulative preferred and common shares. Lands, 505 acres, patented, on the western slope of the Wahsatch Mountains, 4 miles from Brigham City. Mine, as opened, carries mainly lead and silver values, but the company has copper deposits in a prospective stage. Equipment includes a 150-ton concentrator, connected with the mine by a 4,200' aerial tram. Water is piped to the mine and mill under a considerable head, estimated to be capable of generating 180 h. p.

WAIDANI MINE.**JAPAN.**

Letter returned unclaimed from former mine office, Kamine-mura, Taka-gori, Bizen, Japan. Ore is argentiferous chalcopyrite, associated with sphalerite and galena, in two very thin veins. Was a small producer only, and presumably idle for several years.

WALDO SMELTING & REFINING CO.**OREGON.**

Office: P. O. Box 1487, Colorado Springs, Colo. Mine office: Takilma, Josephine Co., Ore. Chas. L. Tutt, president; K. R. Babbitt, vice-president; Spencer Penrose, secretary and treasurer; J. A. Hull, assistant secretary and treasurer; preceding officers, J. A. Hayes, J. O'B. Gunn and Col. T. Wain-Morgan Draper, directors: E. W. Walter, general manager. Organized December 3, 1901, under laws of Colorado, with capitalization \$3,000,000, shares \$100 par. Has the same management as the Takilma Smelting Co., with which it is very closely connected, the Waldo company having an interest in the Takilma smelter.

Lands, 20 patented claims, area 400 acres, with millsite, also 650 acres of placer lands, near the Queen of Bronze mine, in the Waldo district, showing 5 fissure veins, of about 10' average width, giving estimated average values of 12% copper and \$3 gold per ton, from sulphide ores, which probably is too high. Development is by a shaft and two tunnels, with extensive underground openings. The Copper King shaft, about 200' deep, has an 80' cross-cut-drift, showing a good ore body. The 700' Lyttle tunnel and the 400' No. 2 tunnel, on the same claim, show good ore bodies. The 310' Cowboy tunnel connects with the incline shaft, 160' below surface, and is to be extended to intersect known ore bodies. Property is about 40 miles from the Southern Pacific railroad, but a line has been surveyed through the district. The Takilma smelter was blown in, 1904, on Waldo ores. The Queen of Bronze mine of the Takilma company furnishes heavy sulphide ore, and the Cowboy mine of the Waldo provides oxidized ores, for furnace mixtures. Officers of the company are men of standing, with long and successful mining experience, and the property is considered promising.

GEWERKSCHAFT WALDSTOLLN.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Dermbach, Weimar, Ger-

many. Ores mined are spathic iron and a little chalcopyrite, 1902 production of latter having been 60 tons. Employs circa 35 men.

WALES COPPER MINING CO.**ALASKA.**

Merged, 1904, in Hadley Consolidated Copper Co.

WALLACE RIVER COPPER MINING CO.

Office: 89 State St., Boston, Mass.

WALLAROO & MOONTA MINING & SMELTING CO., LTD.**SOUTH AUSTRALIA.**

Offices: Grenfell St., Adelaide, South Australia. Mine offices: Wallaroo, Yorke Peninsula, and Moonta, Yorke Peninsula, South Australia. Works office: Port Wallaroo, Yorke Peninsula, South Australia. Employs circa 2,500 men. D. Davidson, secretary; H. Lipson Hancock, general manager. The Wallaroo mine, discovered 1860, and the Moonta mine, opened circa 1861, both on the Yorke Peninsula, about 10 miles apart, were amalgamated, 1890, under the present title. Has paid dividends, to end of 1905, of £224,000, and this company and its predecessors have paid dividends of £1,822,254, from a total mineral production valued at £12,245,554.

The Wallaroo mine, which includes the Kurilla, an adjoining property, is 6 miles east of Port Wallaroo, and employs 1,130 men, or nearly half of the total force, the balance being employed in the Moonta mines and at the reduction works. Area of the Wallaroo, including the Kurilla, is circa 2,000 acres, this property showing 6 practically parallel veins, the main ore body having a nearly vertical dip, with strike of North 75° West, ranging 3' to 25' in width and being opened for a length of 1,800' and to a depth of about 2,500'. Country rock is metamorphosed mica-schist. The gossan gave a little atacamite and carbonate ores at surface, followed by cuprite and melaconite, but the oxidized bodies were worked out, many years ago. At depth the ore is mainly chalcopyrite, averaging 2% to 4% copper, as mined, and 11% after dressing. Gangue of the ore is iron pyrites, calcspar and schistose country rock, ores being slightly auriferous and argentiferous. The Wallaroo and Kurilla jointly have 30 shafts, with circa 35 miles of underground workings. Shafts are mainly inclines on the veins, hoisting with 2-ton and 3-ton skips, principal shafts being Taylor's shaft, 2,070' deep, the Office shaft, 1,920', and Young's shaft, 1,350'. The principal portion of Taylor's shaft was ruined by fire, early in 1904, and has been replaced by a new vertical shaft from surface, connecting with the lower levels of the old workings. The fire did much damage, destroying the pumping apparatus to a depth of 2,000', but by heroic efforts pumps were installed, with compressed air power, since replaced by electric pumps. The Kurilla mine is opened on a lode parallel to the Wallaroo, to a depth of 1,170', the ore body ranging 10' to 12' in width, but being bunchy, with high-grade chutes of ore averaging 11%, after hand-dressing. Ore in both the Wallaroo and Kurilla is won mainly by overhand stoping. Wide stopes are timbered by wooden pillars, with waste-filling on either side of the drifts.

The Moonta mine, 12 miles south of Port Wallaroo, was operated for years by a separate company, which was the first mining corporation in

Australia to pay £1,000,000 in dividends, though opened some ten years later than the rich gold mines of Bendigo and other Victorian fields. Area of the Moonta group is 2,673 acres, leasehold from the Crown. Country-rock is felsite-porphyry. The Moonta has 27 veins, ranging 6" to 20' in width, with 5 practically parallel main veins, having an average strike of N. 30° E., with numerous stringers and laterals. Development is by 21 trial shafts and 56 working shafts, many of the latter abandoned. Shafts are mostly vertical for a short distance, thence follow the dip of the lode, and the mine has upwards of 40 miles of underground workings. Mining is by both overhead and underhand stoping. Moonta ores are rich, and for years averaged 20%, but now average circa 16% copper, after dressing.

The mines have extensive hoisting, pumping and power plants. Having been opened at a period when mining practice was largely different from that of the present time, there are entirely too many shafts for economical working, and the policy of the present management is to reduce the number of shafts, and increase the capacity of those retained. Upon surface there were a great number of small, isolated machinery plants, and these, as far as possible, are being consolidated and replaced by large and modern plants. A new central power plant, at the Wallaroo branch, is effecting a very large saving in operating costs. Large and commodious changing houses, with shower-baths and lockers, have been built at the principal shafts, and the company maintains a library and reading-room, well supplied with books and periodicals.

The exceptional weight and flaky nature of the gangue renders concentration an exceedingly difficult problem. Large concentrators have been built at both groups of mines, and the process followed at each is essentially the same. The ore is dumped on grizzlies, passing to bins for various sizes, whence drawn off to railway trucks and carried to the concentrators. At the mills, after passing through crushers, with water, the material goes to revolving trommels, from which oversize goes to a traveling-belt, whence ore is picked by boys, and passed through crushers with water. Ores passing a $\frac{5}{8}$ " mesh are treated on especially designed Hancock jigs, and raggings passing $\frac{3}{8}$ " and $1\frac{1}{4}$ " meshes are treated separately on other specially designed Hancock jigs. Material rougher than $1\frac{1}{4}$ " is hand-picked from the traveling belt. The well known Hancock jig, now in use throughout the world, was especially designed by Mr. H. R. Hancock, the former general manager, for the use of these mines. The largest size jigs treat 200 tons of material in 8 hours. About 12% to 15% of the material is slimed, and this goes to spitzkasten, for classification and distribution to round tables and vanners, which turn out a product of 12% copper tenor.

The coarse material and tailings from the wash are piled in heaps, and weathered. These heaps range 20' to 60' in height, the tops of the coarser heaps being laid out in terraces. The heaps are systematically sprinkled, the leach-liquor, carrying 60 to 120 grains of copper to the gallon, running to vats. These heaps cover about 30 acres, and contain upwards of 1,000,000 tons of tailings.

The fine wastes and slimes go to a specially designed leaching plant, and are passed through a series of vats containing leach-liquor, 12 lbs. to 20 lbs. of sulphuric acid being added to the leach-liquor for each ton of slimes treated. The slimes in the vats are agitated by revolving arms, the pulp, after agitation, passing to settling dams and clarifying reservoirs. The leach-liquor is drawn off, in earthen pipes, to the main precipitating works, where it joins the liquor from the various tailings heaps, and copper is precipitated therefrom on scrap iron. The material from the settling dams is weathered and given a second, and occasionally a third, leaching. The production of cement copper from this plant is 15 to 20 long tons weekly. In addition to precipitate the leaching plant makes considerable bluestone.

The smelter, at Port Wallaroo, 6 miles from Wallaroo and 12 miles from Moonta, is connected by rail with both groups of mines. In addition to treating the company's ores, considerable custom smelting is done, the product being a blister copper of exceptional purity, the "Wallaroo" brand of metal having a deservedly high commercial standing. An acid plant, utilizing the fumes of the smelter, furnishes H_2SO_4 for the lixiviation plants at the mines, and in addition considerable commercial acid is sold. The average annual output of the Wallaroo and Moonta is nearly 15,000,000 lbs. of fine copper, but was only 13,070,952 lbs. in 1904, owing to the loss of production from Taylor's shaft during the greater part of the year, and was 14,563,097 lbs., in 1905. The property is well handled, and many improvements are being introduced by the present highly progressive management.

WALL STREET MINE.**NEVADA.**

Letter returned unclaimed from former mine office, Luning, Nev.

WALTHAM MINE, LTD.**COLORADO.**

Offices: 155, Fenchurch St., London, E. C., Eng. Mine office: Russell Gulch, Gilpin Co., Colo. Dr. J. H. Gower, managing director; E. T. Coote, secretary. Organized June 16, 1903, with capitalization, £25,000, shares £1 par. Lands include the Waltham mine, carrying gold, silver and copper ores. Idle for several years.

WANDILTA COPPER MINES, LTD.**AUSTRALIA.**

Offices: 30, Moorgate St., London, E. C., Eng. Mine office: Kadina, Yorke Peninsula, South Australia. A. S. Caine, chairman; J. A. Russell, secretary. Lands, 140 acres, including the Wandilta mine, near Wallaroo. Main shaft, 240'. Vein is 2' to 3' wide, with a limited amount of development. Mine idle and company apparently moribund.

WAPITI MINING CO.**COLORADO.**

Office: 932 Equitable Bldg., Denver, Colo. Mine office: Wapiti, Summit Co., Colo. A. J. White, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Has steam and water power, concentrator and 5' Huntington mill.

FREDERICK WARDE GOLD & COPPER MINING CO.**NEVADA.**

Office: Salt Lake City, Utah. Frederick Warde, president; Jacob Myers, treasurer; A. W. Raybould, secretary. Organized March 1, 1904, with capitali-

zation \$300,000, shares \$1 par. Lands are in the Yellow Pine district of Lincoln county, Nevada. Company is said to have contracted to furnish ore to the Goodsprings Smelting & Development Co.

WAR EAGLE CONSOLIDATED MINING & DEVELOPMENT CO., LTD. BRITISH COLUMBIA.

Office: 49 Wellington St. East, Toronto, Ont. Mine office: Rossland, Yale district, B. C. Geo. Gooderham, president; T. G. Blackstock, vice-president; preceding officers, W. G. Gooderham, A. E. Gooderham, Geo. T. Blackstock, W. H. Beatty, Chas. R. Hanswer and James Cronin, directors; E. B. Kirby, general manager; Carl R. Davis, superintendent; Chas. B. Jenkins, clerk and purchasing agent. Organized January, 1897, under laws of British Columbia, with capitalization \$2,000,000, shares \$1 par; issued, \$1,750,000. Paid dividends of \$544,250, June, 1898 to February, 1900, inclusive, since which date no dividends have been paid. Is controlled, through stock ownership, by the Consolidated Mining & Smelting Co. of Canada Ltd.

Lands include the War Eagle, Richmond, Crown Point and other claims, carrying auriferous and argentiferous copper ores. Like all other mines of the Rossland district, the War Eagle is much lower in grade at depth. Shipments, during 1905, were 60,860 tons, of \$890,269.21 gross value, giving an average of \$11.34 per ton, from which the company received, after deducting freight, smelting, refining and marketing charges, an average of \$5.22 per ton. Production, at beginning of 1906, was circa 5,000 tons monthly, with ore reserves of 45,000 tons at end of 1905, compared with 23,000 tons one year previous. Production, 1905, is estimated at 1,400,000 lbs. fine copper.

WAR EAGLE MINE. ALASKA.

Mine office: Klawok, Alaska. V. Nigelius, manager. Lands are on Big Harbor, 14 miles south of Klawok. In August, 1905, was developing, preparatory to beginning shipments to the Coppermount smelter.

WAR EAGLE MINE. YUKON.

A Yukon property, presumably located near White Horse, which made a small test shipment of bornite, to a British Columbia smelter, circa 1905.

WARRA WARRA MINE. AUSTRALIA.

Office: care of F. Stevens, Grenfell St., Adelaide, South Australia. Country rocks are clay-slates, sandstone and quartzite, in alternate strata. Has two shallow vertical shafts, opening fair-sized ore bodies carrying native copper, cuprite, malachite, chalcocite and chalcopyrite. Idle at last accounts.

WARREN DEVELOPMENT CO. ARIZONA.

Title changed, 1905, to Warren District Development Co.
WARREN DISTRICT DEVELOPMENT CO. ARIZONA.

Office: care of C. D. Hanchette, treasurer, Hancock, Mich. John Funkey, president; J. A. Fuller, secretary. Organized 1903, under laws of Michigan, with capitalization \$100,000, shares \$10 par; issued, \$16,000. Lands, 12 claims, area 200 acres, adjoining the Higgins group, at Bisbee, Cochise county, Arizona. Undeveloped and idle.

WARREN REALTY & DEVELOPMENT CO. ARIZONA.

Office: 510 Lyceum Bldg., Duluth, Minn. Mine office: Bisbee, Cochise

Co., Ariz. Henry B. Hovland, president; Thomas F. Cole, vice-president and treasurer; Charles A. Duncan, second vice-president; Frederic R. Kennedy, secretary; Daniel R. Smith, assistant secretary; William G. Hegardt, assistant treasurer; Hoval A. Smith, general manager; Harvey P. Smith, chief clerk. Organized June 29, 1905, under laws of Arizona, with capitalization \$900,000, shares \$15 par; paid in, \$12. Annual meeting, second Tuesday in April.

Lands, circa 1,700 acres, in the Warren district, all of possible mineral value, but mainly held for surface worth. The tract includes the Cunningham group, and the former holdings of the Calumet & Cochise Development Co., of which 3 claims are of much promise, and likely to make a mine. In June, 1905, the company had erected a gallows-frame, and planned vigorous sinking, the shaft showing some stringers of good ore.

The primary object of the company is to plat and sell lots in a new townsite, called Warren, 3 miles from Bisbee, and to operate street railways, water-works, a sewage system, etc., as the city of Bisbee is badly cramped for room, being built in a narrow gulch, and upon the flanks of precipitous hills. The new townsite, which is adjacent to a number of promising new mines, should prosper. Management is composed of experienced mining men, who are not likely to become blinded, by a flourishing realty business, to the mining possibilities of their holdings.

WARRIOR COPPER CO.

ARIZONA.

Office: 316 Crozer Bldg., Philadelphia, Pa. Mine office: Black Warrior, Gila Co., Ariz. E. M. White, superintendent. Organized March 10, 1906, under laws of Delaware, with capitalization \$1,600,000, shares \$10 par, in \$750,000 cumulative 7% preferred stock and \$850,000 common stock. Has authorized a \$150,000 bond issue, at 6%. Succeeded the Black Warrior Copper Co., Amalgamated, which came to grief financially.

Lands, circa 1,500 acres, in 3 groups, known as the Gold Gulch, Diamond H and Montgomery, latter including the Montana and Dadeville mines, adjoining claims, opened by tunnels of 1,000' and 1,200', with about 3,000' of underground workings, showing a vein of 20' to 60' width, carrying silicious ores, assaying up to 6% copper. Has a steam plant, burning petroleum. Reduction plant includes a 100-ton concentrator, 50-ton matting furnace and 300-ton leaching plant, latter having six 50-ton square tanks, each 20x25' and 5' deep, in a building 62x130'. Tanks are heated by steam coils, facilitating lixiviation. Crushed ore is delivered to tanks from a railroad track, running above, which is to be replaced by a belt-conveyor. While this mine has large ore bodies, and has expended about \$500,000 in development, it never became a steady producer. Property has been mismanaged, and its actual value, or lack of it, can be determined only by the test of operation, under a competent management. Early in 1906 the company was shipping 60 tons of ore daily, to the Old Dominion smelter, at Globe.

WARRIOR MINING CO.

COLORADO.

Office: 622 Main St., Peoria, Ills. Mine office: Fort Garland, Costilla Co., Colo. Dr. L. D. Forman, president; Dr. W. M. Swartz, secretary. Lands, 26 claims and 2 millsites, claimed to show ore assaying up to 12% copper, 20

oz. silver and 2 oz. gold per ton, but from another source it is learned that at last accounts the company had not found ore in place, though the property is considered fairly well located.

WASATCH CONSOLIDATED MINING CO.

UTAH.

Letter returned unclaimed from former office, Salt Lake City, Utah. Apparently was succeeded, 1905, by Wasatch King Mining Co.

WASATCH KING MINING CO.

UTAH.

Office: Troy, N. Y. Mine office: Milford, Beaver Co., Wash. Employs 9 men. Joseph Leggett, president; Geo. E. DeFreest, secretary. Organized 1905, under laws of Utah, with capitalization \$300,000, shares \$1 par. Lands, 6 claims, area 120 acres, including the Wasatch King mine, near the Majestic, 10 miles northwest of Milford, opened by a 560' tunnel.

WASHINGTON CO-OPERATIVE MINING SYNDICATE.

WASHINGTON.

Mine office: Fairfax, Pierce Co., Wash. Lands, 2 claims, 17 miles by trail from Fairfax, said to show a 25' vein, with 3' paystreak carrying disseminated chalcopryite, assaying 5% to 33% copper, 5 oz. to 8 oz. silver and \$2 gold per ton. Has an available water power. Was in hands of a receiver, until company's coal lands, near Fairfax, were sold to the Western Iron, Coal & Coke Co. Idle for several years.

WASHINGTON COPPER & MILLING CO.

WASHINGTON.

A rank fraud, promoted by the notorious L. E. Pike & Co., who are still permitted, by the federal postal department, to peddle worthless "mining" shares to the credulous public, from 294 Washington St., Boston, Mass. These swindlers advertised the mine to be "the richest copper property in the United States, with even more flattering prospects than the Calumet & Hecla or United Verde." The "mine" consisted of 50' shaft, bottomed in gravel.

WASHINGTON COPPER MINING CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Operating office: care of Keweenaw Copper Co., Hancock, Houghton Co., Mich. Chas. A. Wright, president; preceding officer, James N. Wright and Spencer R. Hill, directors. Organized under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,500,000. Ended 1905 with a cash balance of \$2,822.25. Control was secured, 1906, by the Keweenaw Copper Co.

Lands, 1,050 acres, on the western shore of Mosquito Lake, Keweenaw county, Michigan, on which more or less desultory exploratory work has been done, during the past. Idle since 1901.

WASHINGTON COPPER MINING & SMELTING CO.

Office: 5 Tremont St., Boston, Mass. Apparently moribund.

WASHINGTON MINE.

CALIFORNIA.

In Sections 30, 31 and 32, T. 2 S., R. 15 E., Tuolumne Co., Cal. Owned by W. E. & G. A. Hensley. Vein formation is diabase and meta-diabase. Was a small producer, at one time, but has been idle for some years.

WASHINGTON MINERAL MINING & SMELTING CO.

Office: 510 Bernice Blk., Tacoma, Wash. Apparently moribund.

WASHINGTON SMELTING & REFINING CO.

WASHINGTON.

Works office: Keller, Ferry Co., Wash. Organized 1904, with capitali-

zation \$1,000,000, shares \$5 par, to build a smelter, at West Fork, on the Sans Poil river, 15 miles south of Republic, to treat the ores of the Belcher Mining Co. and adjoining properties.

WASHINGTON-SONORA GOLD & COPPER CO.**MEXICO.**

Office: care of A. Sandoval, treasurer, Nogales, Sonora, Mex. A. L. Lewis, president; Percy Sharpe, secretary and general manager. Organized 1902, under laws of Arizona, with capitalization \$2,500,000, shares \$5 par. Lands, 4 pertenencias, area 10 acres, in the Magdalena district of Sonora, Mexico, showing fissure veins and lenses in limestone, carrying a little native copper, and oxide and carbonate ores, giving estimated values of 18% copper, 12 oz. silver and \$4 gold per ton, slightly developed by shafts and tunnels. Presumably idle.

WASHOE COPPER CO.**MONTANA.**

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Employs 300 men. John D. Ryan, managing director; Wm. Skyrme, superintendent; J. B. Gallagher, superintendent sampling works; W. H. Price, foreman at Moonlight mine; Joshua Knight, foreman at Clear Grit mine; John Kane, foreman at Chambers mine. Capitalization \$20,000,000, entirely owned by the Amalgamated Copper Co. Owns the Washoe smelter, which is leased to the Anaconda Copper Mining Co., and the Washoe Copper Co. owes \$7,530,000 to the Amalgamated Copper Co., this being the amount borrowed to construct the Washoe reduction plant.

Lands, 37 acres, including the Moonlight, Clear Grit, Chambers, Washoe, Pacific, Oden and Gold Hill claims, mainly fractional. Company is operating the Moonlight, Clear Grit and Chambers mine. Miscellaneous landed holdings include 1,900 acres of Bear Creek coal lands, in vicinity of Red Lodge, Carbon county, Montana, also a coking coal property at Storrs, Gallatin county, Montana, and the company has a controlling interest in the Coke-dale Coal Co., owning coal lands and 100 coke-ovens.

The Moonlight mine, which is the principal producer, has a 1,300' three-compartment shaft, connected underground with the Blue Jay, Never Sweat, Anaconda and Pacific mines. The mine is timbered with 10x10" square and round timbers, in square sets. Surface equipment includes a 20x48" Dickson hoist, raising 2 double-deck cages with flat cables, also 2 Ingersoll-Sergeant air-compressors, of 50 drills aggregate capacity.

The Chambers mine has a 225' two-compartment shaft, connected with the Dutton and Henry George mines, equipped with a 10x14" hoist raising single-deck cages, and employs circa 80 men.

The Clear Grit mine has a 600' two-compartment main shaft, with a winze 260' below the bottom of the shaft, and is connected underground with the West Stewart and Mountain Consolidated mines. The Clear Grit employs 20 men and development was hampered, until 1906, by litigation with the Heinze interests.

The Washoe Copper Co. owns the Taylor & Brunton sampling works, at Butte, bought 1904. Production, at beginning of 1906, was said to be 425

tons daily, of ore averaging about 3.4% copper, and output of 1906 is estimated at 8,000,000 lbs. fine copper.

WASHOUGAL GOLD & COPPER MINING CO.

WASHINGTON.

Office: 5312 Maple Ave., St. Louis, Mo. Mine office: Washougal, Clarke Co., Wash. Employs circa 30 men. F. A. Mabee, president; J. D. Wilcox, vice-president; J. B. Jordan and T. A. Altman, secretaries; Dr. Otta Sutter, treasurer; preceding officers constitute the directorate; A. D. Wright, general manager; Orrvis Wright, mine superintendent. Organized 1902, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par; issued, \$920,000.

Lands, 560 acres, held on a 30-year state lease, well timbered, in the Bald Mountain district, near Mount St. Helens. Country rock is granite, showing several fissure veins of nearly vertical dip, of which one, under development by a 405' tunnel, with 700' of workings, is of 6' estimated average width, giving ores assaying 5% to 20% copper, up to 15% lead and 15% zinc, 2 oz. to 77 oz. silver and \$1 to \$15 gold per ton. Has gasoline power, with hoists, 3-drill Leyner air-compressor and 7 mine buildings. For 1906 the management plans steady development, and the building of a concentrator. Company is free from debt, and seems to be developing along conservative lines.

WAUKEGAN & WASHINGTON MINING

WASHINGTON.

& SMELTING CO.

Letter returned unclaimed from former mine office, Bossburg, Wash.
WAYEHUTTE MINE. **NORTH CAROLINA.**

Owned by Carolina Copper Co.

WEILERTHALER BERGWERKE G. m. b. H.

GERMANY.

Mine office: Markkirch, Elsass, Germany. Dr. Recht, president; Jakob Siebensschuh, superintendent. Capitalization, 1,400,000 marks. Is a producer of silver, copper and antimony, ore being mainly tetrahedrite. Employed about 150 men, at last accounts.

C. WEISS y CA.

PERÚ.

Office and mine: Nuevo Canete, Perú. Firm was a small producer of ores carrying gold, silver and copper, at last accounts.

WELDON GOLD & COPPER CO.

ARIZONA.

Office: Tucson, Ariz. Mine office: Quijotoa, Pima Co., Ariz. Peter White, president; Jas. A. Green, vice-president; Ferris S. Fitch, secretary, treasurer and general manager; J. W. Giddings, superintendent; Fred Wall, mine superintendent; J. B. Tomlinson, engineer. Organized Jan. 26, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands, 17 claims, area 340 acres, also a 10-acre millsite, in the Quijotoa district, 65 miles from the Southern Pacific railway, showing sundry contact veins between granite and andesite-porphyry, of which 5, of 12' to 35' average width, partially developed, show oxide and carbonate ores at surface and chalcoppyrite at depth, latter being auriferous and associated with sphalerite, galena and iron pyrites, with brecciated quartz gangue, giving assays up to 22% copper. Openings include 5 shafts, deepest 300', and 7 tunnels, 5 of which are crosscuts, longest being a 1,800' crosscut tunnel, with total underground

openings of about 3,000'. The 1,800' crosscut tunnel should not be included in the present workings of the Weldon, because driven many years ago, by previous owners, showing no ore, and running away from the Weldon workings, in addition to which it is abandoned and partly caved in. Has a 15-h. p. gasoline hoist and 4 power drills, with carpenter shop, machine shop, smithy, boarding-house, powder-house, assay office, store and 75x100' mill with 20 stamps, of 100 tons daily capacity. The mill should not be included in the Weldon improvements, because two miles distant, built by former owners, antiquated, abandoned 20 years or so ago and bought by the Weldon company for \$750, for the lumber, the equipment being junk. The officers are mainly men of high standing, and the directorate as a whole must not be held responsible for the somewhat misleading reports regarding the tunnel and mill.

WELLINGTON GROUP.**ARIZONA.**

Office: care of Woods Investment Co., Colorado Springs, Colo. Lands, 26 claims, area 125 acres, at Bouse's Camp, in the Plomosa district of Yuma county, Arizona, 18 miles east of the Colorado river and 2 miles south of the surveyed line of the Arizona & California railroad. The property is in a basin showing diorite, andesite, schist, limestone and sandstone, with occasional conglomerate and granite. The Bullion claim has a 124' shaft, with cross-cuts at 90', showing 5' to 10' of ore, giving assays of 4% to 10% copper. Owners are awaiting construction of the railroad to begin active development.

WELSH COPPER MINING SYNDICATE, LTD.**WALES.**

Offices: 9, Fenchurch Ave., London, E. C., Eng. Mine office: Talybont, R. S. O., Cardiganshire, Wales. J. Bell-Irving, chairman; R. S. Corbett, managing director; W. H. Bartlett, secretary; James Stevens, consulting engineer. Organized Apr. 9, 1902, with capitalization £17,500, shares £1 par: issued, £17,207. Lands, 933 acres, including the Esgair Hir mine, carrying argentiferous sulphide ores of copper and lead, in two fissure veins of 40' average width, claimed by company to average 3% to 10% copper, 4% to 5% lead, and 13 oz. silver per ton, opened by shafts of 150' and 500'. Has a 40-ton concentrator. Idle for several years and property for sale.

WENDENDALE GOLD MINING CO.**ARIZONA.**

Has lands in the Cunningham Pass district, Yuma county, Arizona. Test shipments, early in 1906, to the Humboldt smelter, are said to have yielded 13% copper and \$12 gold per ton.

WENDIGO COPPER CO., LTD.**MICHIGAN.**

Title changed, July, 1901, to Isle Royale Land Corporation, Ltd.

WENTWORTH MINE.**ARIZONA.**

Mine office: care of J. G. Wentworth, superintendent, Payson, Gila Co., Ariz. Idle.

WERDENHOFF MINING & MILLING CO.**IDAHO.**

Office: care of Hon. F. W. Hunt, president, Boise, Idaho. Stephen A. Powell, secretary; Horace E. Neal, treasurer. Capitalization, \$5,000,000. Lands, 11 claims, in the Big Creek district of Idaho county, showing a mineral formation of about 250' width, carrying mainly gold values, with a little lead and copper.

WEST AUSTRALIAN MINING CO., LTD.**AUSTRALIA.**

Reorganized, Apr. 7, 1902, as African & Australian Co., Ltd.

WEST BUTTE CONSOLIDATED & MINING CO.

Office: 325 Olive St., St. Louis, Mo.

WEST BUTTE MINING CO.**MONTANA.**

Office: care of Carroll G. Dolman, secretary and treasurer, Butte, Silver Bow Co., Mont. Chas. Schmidt, president; W. McConnell, vice-president. Organized February, 1906, with capitalization \$3,000,000, shares \$5 par. Property is options on the Columbia and Montrose claims, in the western part of the Butte district. The Columbia claim, area 9.32 acres, has a 144' shaft, claimed to have produced \$100,000 in silver ore, many years ago. Present management is alleged to plan deepening this shaft to 2,100'.

WEST CHILLAGOE MINES.**AUSTRALIA.**

Sundry idle claims, in the Chillagoe district of Queensland, Australia.

WEST COLUSA MINE.**MONTANA.**

Owned by Boston & Montana Copper & Silver Mng Co.

WESTERN EXPLORATION CO.**CALIFORNIA.**

Mine office: Kennett, Shasta Co., Cal. Ben Calkins, president; Chas. L. Scott, secretary; Willard F. Snyder, general manager. Was operating the Balaklala mine, in 1905.

WESTERN MINING CO.**COLORADO.**

Office: 71 Broadway, New York. Mine office: Lake City, Hinsdale, Co. Colo. Saml. D. Nicholson, general manager; N. A. Nicholson, superintendent. Property includes the Ute and Ulay mines, producing lead, copper, gold and silver. Has water, steam and electric power and a 200-ton concentrator, employing about 100 men, at last accounts.

WESTERN MINING CO.**MONTANA.**

Office: Butte, Mont. Property, the Indian Queen mine, at Apex, Beaverhead county, Montana, is under option to Amalgamated Copper Co.

WESTERN MINING & DEVELOPMENT CO.**COLORADO.**

Office: 42 Home Bank Bldg., Detroit, Mich. Mine office: Pearl, Larimer Co., Colo. A. C. Stellwagen, president; F. W. Henninger, vice-president; J. D. Mackay, secretary and treasurer; C. E. Knapp, general manager; Harold Wilson, superintendent. Property was a lease, expiring 1906, on the holdings of the Pearl Copper Mining & Smelting Co.

WESTERN MINING & STEEL CORPORATION.**CALIFORNIA.**

Was said, September, 1905, to be exploring for copper and iron, on several ranches near Los Osos, San Luis Obispo county, California.

WESTERN MONTANA MINING CO.**MONTANA.**

Office: Park Bldg., Pittsburg, Pa. Letter returned unclaimed from former mine office, Superior, Missoula Co., Mont. A. H. Gray, superintendent; C. L. Butterfield, financial agent. Organized 1905. Lands, sundry claims, near the Monitor mine, in the Salt Lake district.

WESTERN SLOPE COPPER MINING & SMELTING CO.**COLORADO.**

Office: 38 Ames Bldg., Boston, Mass. Mine office: Grand Junction, Mesa Co., Colo. Henry H. Marden, president; J. H. McCurdy, treasurer;

James V. Howard, secretary; W. C. McCurdy, general manager; Wm. Lynch, superintendent. Organized July 25, 1900, under laws of Colorado, with capitalization \$750,000, shares \$1 par.

Lands, 14 claims, area circa 290 acres, in the Unaweep district, 23 miles southeast of Grand Junction and 12 miles from Whitewater, the nearest railroad point. Principal development, on the Nancy Hanks claim, includes a 250' shaft, from which 17 cars of ore, shipped to smelter, several years ago, gave returns of 11% to 18% copper. Company is said to have blown in a 50-ton matting furnace, June, 1905, but nothing has been heard of the smelter since, and presumably it is idle. Company paid regular quarterly dividends, of $\frac{1}{2}\%$, while peddling stock, and while the property is considered promising, the company is looked upon with suspicion.

WEST FORK GOLD-COPPER MINING CO.

IDAHO.

A rank fraud, promoted by the notorious L. E. Pike & Co., of 294 Washington St., Boston, Mass., who still are permitted, by an indulgent government, to conduct their swindling operations through the United States mails.

WEST GROUP.

BRITISH COLUMBIA.

Mine office: Yreka, Vancouver Island, B. C. Lands adjoin the Yreka. Idle.

WEST LE ROI MINING CO., LTD.

BRITISH COLUMBIA.

Compulsorily wound up, November, 1901.

WESTMORELAND COPPER CO.

NEW BRUNSWICK.

Office: Dorchester, N. B. Apparently an erroneous title for Intercolonial Copper Co.

WEST MOUNTAIN MINING COMPANY, OF ARIZONA.

UTAH.

Dead. Lands lost, and money refunded to those who bought stock of Eastern promoters. Apparently an honest failure.

WEST QUINCY MINING CO.

UTAH.

Office: Atlas Blk., Salt Lake City, Utah. Mine office: Park City, Summit, Co., Utah. G. D. B. Turner, president and general manager; J. H. Moyle, vice-president; R. E. Miller, secretary; Sherman Fargo, treasurer; preceding officers, J. H. Rand, Dr. E. V. Van Norman and W. H. Dodge, directors. Organized 1904, under laws of Utah, with capitalization \$1,500,000, shares \$5 par. Annual meeting, second Tuesday after first Monday in May.

Property is a $\frac{3}{8}$ interest, with an option on the remaining interest, in the J. I. C. mine, lands, 5 claims. Development is by a 600' two-compartment vertical shaft, and by a crosscut tunnel through property of the Little Bell mine, begun December 1, 1904, which cut a contact vein, giving assays up to 20% lead, 160 oz. silver and \$2 gold, and it is expected that the main ore body will be cut at depth, giving a back of 750', and that the Daly West contact vein will be cut at depth, giving a back of 900'. Considerable trouble has been had from shifting ground and a heavy inflow of water.

WESTRALIAN COPPER MINE, LTD.

AUSTRALIA.

Reorganized, circa 1899, as Balla Balla Copper Mines, Ltd.

WEST ST. DAVID'S GOLD & COPPER MINES, LTD.

WALES.

Offices: 156, Leadenhall St., London, E. C., Eng. Capital, £7.

WEST SIDE MINING CO.**WASHINGTON.**

Letters returned unclaimed from former office, Seattle, Wash.

WEST SLOPE MINING & MILLING CO.**UTAH.**

Dead. Lands were near La Sal, Grand county, Utah.

WETTERHORN LAND CO.**MICHIGAN.**

Letter returned unclaimed from former office, Ontonagon, Mich. Organized under laws of California. Lands, 760 acres, in Sections 21 and 22, Town 51 North, Range 42 West, Ontonagon county, Michigan. Has a 60' shaft, in an amygdaloid carrying some copper, both coarse and fine, with a little barrel copper on the hanging wall. Idle.

WEYMAN & YOUNG.**ALASKA.**

Office and mine: Coppermount, Alaska. E. E. Weyman, superintendent. Lands, sundry claims, showing auriferous and argentiferous copper ores, slightly developed.

WHALE MINE.**NEW MEXICO.**

Mine office: Tres Piedras, Taos Co., N. M. Idle.

WHALEN COPPER MINING CO.**NEVADA.**

Bankrupt. Died in bad odor.

WHAT CHEER COPPER MINING CO.**WYOMING.**

Office: 171 Westminster St., Providence, R. I. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. Wm. C. Price, president; J. Frank Baird, vice-president; J. F. Freeman, secretary and treasurer. Organized under laws of Wyoming, with capitalization \$600,000. Lands, 4 claims, near the Aetna, on Dunkards Creek, near Purgatory Gulch, opened by a 65' two-compartment shaft and a 237' tunnel, showing stringers of copper ore. Equipment includes a steam plant and small sawmill.

WHEALKATE MINING CO.**MICHIGAN.**

Office and mine: Houghton, Houghton Co., Mich. Nathan F. Leopold, president; R. R. Goodell, vice-president; Reginald C. Pryor, secretary; Albert F. Leopold, treasurer. Organized November, 1902, under laws of Michigan, with capitalization \$50,000, shares \$25 par. Lands, 240 acres, including the old Wheal Kate property, on which a little sadly misdirected mining was done, many years ago. Is primarily a land and townsite company, but owns mineral lands in Section 17, carrying the southern extension of the Isle Royale and other cupriferous beds.

WHIM WELL COPPER MINES, LTD.**AUSTRALIA.**

Offices: 11, Ironmonger Lane, London, E. C., Eng. L. Downs, secretary. Capitalization £150,000: issued, £100,007. Lands, 260 acres, in the Pilbarra goldfield, Western Australia. Apparently moribund.

WHIPSAW COPPER CO.**ARIZONA.**

Office: 35 Wall St., New York. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz.

WHITE BEAR MINE.**BRITISH COLUMBIA.**

Mine office: Rossland, Yale district, B. C. Mine is about 1,000' deep. Ore is a friable chalcopryite, carrying gold and silver values, and slimes badly in concentration. Equipment includes a 150-h. p. Jenckes electric hoist, and

a 30-drill Rand compound air-compressor, driven by a 300-h. p. electric motor. Mill has 30 gravity stamps, with double-discharge mortars, 6 Wilfley concentrating tables and a 4-unit Elmore oil concentrator. Production was circa 2,000 tons of ore, 1904. Presumably idle.

WHITE EAGLE COPPER MINING CO.**TEXAS.**

Dead. Lands sold to pay company's indebtedness.

WHITE EAGLE MINING CO.

Has lands in the vicinity of Empire Flats, on the Colorado river, near the Bill Williams Fork river, presumably in Yuma county, Arizona, but possibly in San Bernardino county, California, and in 1906 planned joining other companies in that vicinity in building a small smelter, on Empire Flats.

WHITE HORSE MINING CO.**ARIZONA.**

Office: 20 Broad St., New York. Lands, 200 acres, in Yavapai county, Arizona. Idle for several years.

WHITE KNOB COPPER CO., LTD.**IDAHO.**

Office: 36 Wall St., New York. Mine office: Mackay, Custer Co., Idaho. Harry J. Luce, president; Wilbur K. Mathews, vice-president; Chas. G. Funk, secretary; Chas. B. Van Nostrand, treasurer; A. M. Poole, assistant secretary and treasurer; preceding officers, E. C. Platt, E. Roscoe Mathews, E. B. Sheldon and J. R. Foster, directors; Frank E. Leland, mine superintendent; Ravenel MacBeth, manager, under lease. Organized, originally, under laws of West Virginia, as the White Knob Mining Co., with capitalization \$5,000,000; reorganized, with present title, April 24, 1900, under laws of New Jersey, with capitalization \$12,500,000; again reorganized, January, 1903, under same charter and title, with capitalization \$2,000,000; again reconstructed, 1904, with capitalization \$2,600,000, shares \$10 par; issued \$1,600,000. A further reorganization, planned December 6, 1904, provides for a \$3 assessment on stock, upon payment of which old shareholders should receive 30% preferred and 70% common shares of a new issue. Nathan H. Clark and W. K. Mathews were appointed receivers, October 1, 1904. Debentures \$500,000, in 10-year sinking-fund gold bonds, at 6%, due 1913. On March 2, 1904, company authorized an issue of \$1,000,000 of 6% convertible sinking-fund gold bonds. Reorganization plan calls for a new company, with \$6,000,000 capitalization, shares \$10 par, in \$2,000,000 cumulative 7% preferred, and \$4,000,000 common shares, giving bondholders new stock at par, with a bonus of 233% in common stock. Annual meeting, first Tuesday in January.

The company endeavored to purchase control of the Balakalala Consolidated Copper Co., but the control of the Balakalala was sold twice, and holdings of 50,000 shares of Balakalala are said to have been sold, February, 1906, at an average price of about \$9 per share. The company has expended \$3,000,000, in Idaho, to very poor advantage.

Lands, 32 claims, 3 millsites, the 90-acre townsite of Mackay, sundry timber lands, water-rights and right-of-way for an electric line, all in the Lost River Valley, with an area of circa 2,100 acres. The main shaft is 700' deep, connecting with the Albert tunnel, about 1,500' long, and mine has circa 6 miles of workings, with considerable ore blocked out for stoping.

Property is claimed to show a 23' vein, carrying 3% to 9% copper and \$1.75 to \$3 gold and silver, but average tenor of ore apparently is about 2% to 3% copper only, with correspondingly reduced gold and silver values. Equipment includes hoists, a 10-drill air-compressor and a 3-drill auxiliary compressor. The mine is reached by a 96-mile branch of the Oregon Short Line railway, running from Blackfoot to Houston, and is connected with the smelter by a 10-mile electric railway having a maximum gradient of 6%, in a rise of 2,000'. The electric equipment is said not to have proven economical in operation, and may be displaced by a Shay mountain-climbing locomotive.

The smelter had three 200-ton blast-furnaces, and was blown in September, 1902, but was closed down after a month's run. One stack was blown in again, October, 1903, but was closed down again. In November, 1903, the smelter was said to be treating 300 to 500 tons of ore daily, making therefrom, circa 15,000 lbs. fine copper, 800 oz. fine silver and 20 oz. fine gold, which would indicate smelter returns from ore of only 1.5% to 2.5% copper, and \$1.75 to \$2.75 gold and silver per ton. The furnace was partially dismantled, 1905, with the intention of removing it to Shasta county, California, but this attempt proved a fiasco, like every other move ever made by the White Knob, under its various titles. Discontinuing work in Idaho, and buying into a lawsuit in California, is the management's idea of how to run a copper mine. The most sensible thing the company has done yet was to lease its mine to Ravenal MacBeth. Of course a tributor gouges a mine—that's what he's there for—but any management whatever would be an improvement on the affairs of the White Knob.

The policy of the White Knob has been consistent in one thing only, that being the utter inconsistency of its management. Mine officials have been changed repeatedly, reorganization has followed reorganization, stock has been increased, decreased and bonds issued, authorized and redeemed. The smelter has been blown in, blown out and blown in repeatedly. Whether the mine is valuable or worthless nobody knows. Such a management would make a fist of it if given the Calumet & Hecla to manage. The best opinion seems to be that the mine has considerable ore, but is dangerously low in grade. The management of the White Knob should quit burlesque copper mining, and try running a chicken-ranch, or some other business suited to its ability.

WHITE KNOB COPPER & DEVELOPMENT CO., LTD.

IDAHO.

A corporation, organized under laws of Maine, to take over the White Knob Copper Co., Ltd., being one of the links in the extremely weak chain of promotions of the White Knob mine.

WHITE KNOB MINING CO.

IDAHO.

Reorganized, 1900, as White Knob Copper Co., Ltd.

WHITE PINE COPPER CO.

NEVADA.

Dead. Property sold, circa 1905, to Nevada Consolidated Copper Co.

WHITE PINE MINE.

MICHIGAN.

Office: care of Robt. Selden Rose, superintendent, Marquette, Mich. Lands, 80 acres, in the Porcupine Mountains, Ontonagon county, Michigan, 2

miles from the Nonesuch mine, carrying a continuation of the Nonesuch lode. Lands are owned by the Keweenaw Association and the Porcupine Mountain company. Development is by a 170' shaft and 4 shallow pits, all bottomed in the lode. Never a producer, and idle many years, until resumption of prospecting work, with a force of 4 or 5 men, in the summer of 1906.

WHITE PINE MINE.**MONTANA.**

Office and mine: care of Steuwe, Schmidt & Co., Helena, Lewis & Clark Co., Mont. A 16" vein carrying ores assaying \$86 per ton in gold, silver and copper has been opened by a 220' tunnel and 250' crosscut. Presumably idle.

WHITE ROCK COPPER MINING CO.**CALIFORNIA.**

Office: Ellsworth, Me. Mine office: Lewis, Mariposa Co., Cal. Chas. C. Burrill, president. Lands, 30 acres, patented, showing heavy gossan outcrops, with schistose diabase vein-matter 100' wide. Ore is sulphide at depth of 100'. Main shaft, 150', with 950' of underground openings. Smelter shipments, 1902, of 450 tons of oxide and carbonate ores, gave average returns of 20% copper and \$2 to \$4 gold and silver per ton. At last accounts, March, 1906, property was advertised at sheriff's sale.

WHITE TANKS MINING CORPORATION.**ARIZONA.**

Office: 740 Land Title Bldg., Philadelphia, Pa. Letter returned unclaimed from former mine office, Phoenix, Ariz. Lands, sundry claims, in the White Tanks Mountains, circa 40 miles west of Phoenix, Maricopa county, Arizona. Apparently moribund.

WHITNEY REDUCTION CO.**NORTH CAROLINA.**

Mine office: Gold Hill, Rowan Co., N. C. Lands adjoin the Union. Idle.

WICKENBURG SMELTING & REDUCTION CO.**ARIZONA.**

Dead.

WICKES-CORBIN COPPER MINING CO.**MONTANA.**

Offices: care of J. A. Bender, Chicago, Ills., and 19 East Broadway, Butte, Mont. Letter returned unclaimed from former mine office, Corbin, Jefferson Co., Mont. Organized 1904, with capitalization \$1,000,000, shares \$1 par, as successor of Colorado Mining & Development Co. Lands, sundry claims, including the Hidden Treasure and Copper Queen groups, carrying auriferous and argentiferous copper ores.

WILD BILL MINE.**MONTANA.**

Owned by Anaconda Copper Mining Co.

WILLIE BOY MINE.**OREGON.**

Mine office: Comer, Grant Co., Ore. Presumably idle.

WILL SMELTING CO.**ARIZONA.**

Office: 218 Fleming Block, Phoenix, Ariz. Works offices: Wickenburg, Maricopa Co., Ariz., and Quartzite, Yuma Co., Ariz. Joseph Boyer, superintendent. Property includes a 40-ton custom smelter, general store and hotel at Wickenburg, and a 50-ton furnace at Quartzite, also 5,400 acres of placer ground, near Quartzite.

WILMOT MINING CO.**MICHIGAN.**

Office: Ontonagor., Mich. W. H. Garlick, president. Lands are mineral rights only, to 3,520 acres, in Ontonagon county. Idle.

WILTON MINING & MILLING CO.**ARIZONA.**

Office: 615-87 Washington St., Chicago, Ill. Mine office: Huron, Yavapai Co., Ariz. W. A. Buchanan, president; F. W. Park, vice-president and secretary; Victor Schill, treasurer; Milo Schill, general manager; preceding officers and Thos. McSteel, directors. Organized 1902, under laws of Arizona, with capitalization \$1,200,000, shares \$1 par. Company is said to be free from debt. Lands, 3 claims, area 60 acres, in the Big Bug district, said to be only one half-mile from the Humboldt smelter. Property shows fissure veins carrying auriferous copper ore, opened by 4 shafts, deepest 50', and by a 220' tunnel, on the strength of which openings the company estimates 1,000,000 tons of \$50 ore blocked out, which is absolutely impossible. From the million tons claimed to be blocked out, the company has managed to extract about 75 tons, which ore is on the dump, and at this rate of production the million tons will last a long time. Company has secured ores assaying 19.5% copper, 3 oz. silver and \$4.30 gold per ton. The officers are men of good standing, and the management seems honest, but utterly inexperienced, and its ridiculous claims regarding the amount of ore blocked out must injure its standing.

WINDFALL MINING CO.**WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. C. T. Rigg, superintendent, at last accounts. Ores carry gold, silver, lead and copper. Presumably idle.

WINNEBAGO MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power.

WINNIPEG MINES, LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Phoenix, B. C. John Dean, president; Richard Plewman, secretary, treasurer and general manager. Bankrupt, in all likelihood.

WINNIPEG MINING & MILLING CO.**WASHINGTON.**

Mine office: Republic, Ferry Co., Wash. Geo. L. Moody, superintendent. Lands include the Hawkeye mine, near the Belcher, presumably carrying the same grade of ore. Is said to have ordered an 8-drill electric plant, and to plan using power from the Belcher electric installation.

WINONA COPPER CO.**MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. Employs circa 100 men. Arthur G. Stanwood, president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; preceding officers, Chas. J. Paine, Wm. A. Paine, Nathaniel H. Stone and James H. Seager, directors. Dr. L. L. Hubbard, general manager; Rex R. Seeber, superintendent; Wm. H. Charlton, clerk. Organized 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Paid in, \$11. Last assessment was \$1, February 25, 1906. Is closely allied, in ownership and management, with the Challenge and King Philip mines, under control of St. Mary's Mineral Land Co. Boston Safe Deposit & Trust Co., registrar; American L an & Trust Co., Boston, transfer agent. Shares are listed on the Boston Stock Exchange. Annual meeting, last Tuesday in March. Expenditures

during 1905 were \$114,704.45, and year was ended with balance of assets of \$12,827.71.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$1,000,000.00
Amount paid in by conveyance of property.....	450,000.00
Entire amount invested in real estate.....	479,724.00
Amount of personal estate.....	55,981.98
Amount of floating debt.....	26,867.69

Lands, 1,568 acres, in a main tract of 1,440 acres and a smaller tract of 128 acres, main tract being in Sections 19, 20, 29 and 36, Town 52 North, Range 36 West, also timber rights to 1,768 acres lying 3 to 5 miles south of the mine. An exchange of equal parcels of land with the King Philip has given improved holdings to both properties. The main tract carries the outcrop of the Winona amygdaloid bed for upwards of one mile. The mine was discovered, 1864, by a line of prehistoric pits along the outcrop, and a single shallow shaft was then sunk, but owing to entire lack of transportation facilities, little was accomplished. The property was let on tribute, 1880, but did not furnish sufficient mass copper to pay, and was closed, until taken over by the present company, April, 1898, when the old shaft was cut down, retimbered and deepened, and 3 new shafts sunk, on the Winona lode, an amygdaloid bed running 12' to 46' wide, with a strike of N. 59° E., and a dip of about 70°. The Winona amygdaloid resembles the Baltic lode in some respects, and also bears considerable resemblance to the Knowlton bed of the Evergreen belt, carrying considerable epidote, calcite and quartz, with a limited amount of mass and barrel copper, but the bulk of the metal is found as stamp-copper. Diamond drill borings have located several other cupriferous beds on the Winona tract, but none carried copper in payable quantities, where cut.

No. 1, the discovery shaft, in the NE. $\frac{1}{4}$ of the NE. $\frac{1}{4}$ of Section 29, T. 52 N., R. 36 W., is 8x18' inside of timbers, with three compartments, and is 400' deep, with 4 levels opened, showing a little heavy copper and some stamp-rock in the northern drifts, but was of little promise, and has been idle since circa 1901.

No. 2 shaft, 900' northeast of No. 1, sunk at an angle of 72°, is 1,000' deep, with 9 levels opened. This shaft gave good copper to a depth of circa 200', but the ground averaged poor below that depth, and work was stopped early in 1906, though the south drifts showed some improvement. The new hoist at No. 2 is good for 1,500' depth, and probably will be used at some other shaft.

No. 3 shaft, 1,650' southwest of No. 2, was 960' deep in March, 1906, with seven levels opened. The third and fourth levels have been extended to the boundary, a distance of 1,600', showing alternations of poor and good ground. The fourth level shows a little improvement, and the 600' south drift on the 6th level shows good ground. The openings are estimated to carry rock averaging 17 lbs. to 18 lbs. fine copper per ton, allowing for judi-

cious stoping and reasonable selection of ground broken. Equipment at No. 2 includes a hoist good for 1,500', a 29x70' steel shafthouse and a 40x50' steel rockhouse, 106' high.

No. 4 shaft, circa 1,500' south of No. 3, near the southern line, is sunk on ground secured from the King Philip in rectifying the boundary lines. The shaft is sunk in the footwall, and is being opened by simultaneous sinking and raising, which is possible by reason of the long drifts from No. 3 having opened ground tributary to No. 4.

Old No. 3 shaft, now idle, 900' north of No. 2 and about 750' deep, shows little ground of promise. Old No. 4, the northernmost shaft, is about 1,350' northeast of No. 1 and also is idle, having found nothing of importance. Old No. 5 shaft was started on a wide amygdaloid bed, located by diamond drill, but did not develop good ground, and was discontinued at slight depth.

The mine employed 7 power drills, at the end of 1905, of which 2 were sinking and 5 drifting. The mine has about 4 miles of underground openings, and apparently the southern end of the property will make a mine, the showing to the north averaging poor.

The engine-house, located midway between shafts 1 and 2, is 40x40', of steel frame on stone foundations with corrugated iron siding and roof. This building contains 2 hoists, each good for 1,500' depth, operating Nos. 2 and 3 shafts, also an Ingersoll-Sergeant "Class A" two-stage straight-line 12-drill air-compressor, and a smaller single-stage compressor. Adjoining is a boiler-house, 40x48', of steel on stone foundations, with iron siding and roof, housing four 80-h. p. boilers. Other mine buildings are a 34x48' combination engine and boiler house, 26x40' warehouse, 20x40' carpenter shop, 22x34' smithy, 30x40' store building, office building, two boarding-houses, 16 frame dwellings and 9 log houses, the dwellings being built in a townsite platted by the company. The Winona also has a sawmill, 30x70', with a 42x66' wing for boilers, and a 16x46' wing containing a shingle mill, the plant having a daily capacity of 20,000' of sawed lumber. The main line of the Copper Range railroad passes near the mine, and a spur has been built to No. 2 shaft.

Production was begun, with one leased stamp, at the Atlantic mill, in December, 1902, and continued for nearly two years. This work was in the nature of an extensive test, although the Winona made 1,036,944 lbs. fine copper in 1903, and 646,025 lbs. in 1904. The results indicate that the property has the making of a mine, the returns being 18.95 lbs. fine copper, per ton stamped, in 1904. Milling was discontinued about Nov. 1, 1904, and all energies bent toward opening the mine, no copper being made in 1905. It is planned to resume production, probably with one leased head at the Adventure mill, before the close of 1906. The mine has a good management, and will be given every opportunity to prove itself a profitable producer.

WINONA GOLD-COPPER MINING CO. WYOMING.

Office: 681 Grant Ave., Denver, Colo. James R. Saville, president and treasurer; Henry F. Tower, secretary. Organized under laws of Wyoming, with capitalization \$5,000,000, shares \$1 par. Lands, 23 claims, area 475

acres, in the Sunlight district of Big Horn county, Wyoming, showing various veins of 8' to 30' width, claimed to give assays of 15% to 52% copper, 11 oz. to 15 oz. silver and about \$1 gold, per ton. Property is well timbered and has a good water power available. Idle for several years.

WINONA-REX COPPER MINING CO.**WYOMING.**

Office: care of John Ludwig, president, Winona, Minn. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo.

WINTHROP MINE.**CALIFORNIA.**

Owned by Bully Hill Copper Mining & Smelting Co.

WINTHROP MINE.**MICHIGAN.**

Office: care of L. C. Palmer, owner, Marquette, Mich. Lands, 800 acres, in Sections 22, 23, 26 and 27, 58-31, Keweenaw county, Michigan. In 1852-1860, \$90,000 was spent in mining a fissure vein. Since idle. May be sold to Frontenac.

WIRRAPOWIE MINE.**AUSTRALIA.**

Mine office: Leigh's Creek, South Australia. W. H. Williams, superintendent. Has steam power and employed circa 25 men, at last accounts.

WISCONSIN & ARIZONA MINING CO.**ARIZONA.**

Office and mine: care of M. H. Ryan, president and superintendent, Prescott, Yavapai Co., Ariz. J. L. Jacquot, vice-president; E. G. Jones, secretary; Dr. Donald McIntyre, treasurer. Organized December, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, known as the Copper King group, 4 miles north of Poland. Has shafts of 35', 35' and 50', also a short tunnel showing a 5' vein carrying 6" stringers of high-grade auriferous and argentiferous ore.

WISCONSIN MINE.**CALIFORNIA.**

Office and mine: care of Chas. Richardson, owner, Darwin, Inyo Co., Cal. Has a 150' shaft, cutting a contact vein of 2' to 6' width, between limestone and granite, showing cuprite, malachite and chalcopyrite. Idle.

WISCONSIN-WYOMING COPPER MINING CO.**WYOMING.**

Office: care of Wm. Ott, president, La Crosse, Wis. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. R. B. Gelatt, vice-president; W. E. Polleys, treasurer; John M. Vrchota, secretary and general manager. Organized 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 10 claims, in 2 groups, one of 7 claims lying south of the Indianapolis and north of the Beulah, and one of 3 claims lying about one-half mile east of the Hidden Treasure.

WISSAHICKON GOLD-COPPER CO.

Organized 1902, under laws of Delaware, with capitalization \$1,000,000.

WISSENER BERG- UND HÜTTENWERKE**GERMANY.****AKTIEN-GESELLSCHAFT.**

Office: Köln, Germany. Mine office: Wissen-am-Sieg, Rheinprovinz, Germany. Capitalization, 8,000,000 marks. Is an extensive producer of iron ore, 1902 output having been 109,483 metric tons of spathic iron ore and 1,092 metric tons of ore of 10% copper tenor. Employs circa 1,000 men.

WOLCOTT COPPER MINING CO.**VERMONT.**

Mine office: Wolcott, Lamoille Co., Vt. Organized, circa 1900, with capitalization \$500,000, shares \$1 par. Idle.

WOLFRAM COPPER CO.**ARIZONA.**

Office: care of Benj. Blanchard, general manager, Prescott, Ariz. Lands, sundry claims, in the Bill Williams Fork river district of Yuma county, Arizona, near the line of the Arizona & California railroad.

WOLVERINE & ARIZONA DEVELOPMENT CO.**ARIZONA.**

Reorganized, March, 1904, as Wolverine & Arizona Mining Co.

WOLVERINE & ARIZONA MINING CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. John Daniell, president; Paul P. Roehm, vice-president; W. Frank James, treasurer; F. C. Fenner, managing director; preceding officers, W. H. Brophy, Fred Braastad, Thos. Maslin, Edw. Ulseth, B. F. Chynoweth and Arthur E. Delf, directors; W. R. Oates, secretary; W. H. Roberts, clerk and superintendent pro tem. Organized 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$15 par; issued 96,654 shares.

Lands, 9 claims, area circa 160 acres, claims being known as the Cairo, Memphis, Kentucky, Georgia, Louisiana, Chicago, Warren, George and Broken Promise. The Georgia claim lies about 600' from the lands of the Calumet & Arizona, and about 3,000' from the Irish Mag shaft of the Calumet & Arizona and the Spray and Holbrook shafts of the Copper Queen, three of the richest shafts in the Warren district. The Uncle Sam and White Tail Deer mines of the Copper Queen are adjacent to the Wolverine & Arizona holdings, and leasers have taken rich ore from the White Tail Deer about 800' from the Wolverine shaft, which is 700' deep, with three compartments, each 5'x4'6" and well timbered, cutting limestone showing considerable iron. The shaft has proven very wet at depth, and has No. 7 and No. 9 Cameron sinking pumps and a 500-gallon Prescott station pump. A drift on the 500' level runs 850' toward the Pittsburg & Duluth, cutting leached ore and ledge matter carrying traces of copper, and drifts run in other directions show encouraging quantities of leached material, but no ore of workable grade had been developed up to Sept. 1, 1906.

Surface equipment includes a 260-h. p. steam plant, 2 single-drum hoists, a 6-drill air-compressor, 25x50' engine-house, office, bunk-house, boarding-house and a 10,000-gallon water tank, water being pumped from Naco, 8 miles distant. A large stock of timber and other supplies is carried. The final bond payments do not fall due until Jan. 31, 1907, and most of the payments due on bonds have been taken in stock. The Wolverine & Arizona lands are considered promising.

WOLVERINE COPPER MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Kearsarge, Houghton Co., Mich. Employs circa 500 men. Jos. E. Gay, president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; preceding officers, Joseph W. Howe and Samuel L. Smith, directors; Fred Smith, superintendent; Willard J. Smith, assistant superintendent; Chas. Noetzel, clerk; Wm. Pollard, min-

ing captain; B. S. Shearer, mill superintendent; F. Wm. Hartmann, engineer; A. B. Holtenhoff, master mechanic. Organized 1890, under laws of Michigan, with capitalization \$1,500,000, shares \$25 par. Has paid dividends of \$2,430,000 to end of 1905, and paid a semi-annual dividend of \$480,000 on April 1, 1906. Fiscal year ends June 30. Adams Trust Co., Boston, registrar, American Loan & Trust Co., Boston, transfer agent. Annual meeting, first Monday in August.

Official returns to the state of Michigan, as of date Jan. 1, 1905, disclose the following figures:

Amount of cash paid in on capital stock.....	\$780,000.00
Amount paid in by conveyance of property.....	550,000.00
Entire amount invested in real estate.....	720,665.23
Amount of personal estate.....	812,370.93
Amount of floating debt.....	72,215.34

The following table gives comparative figures for three fiscal years ending June 30:

	1902	1904	1906
Mineral production, pounds	6,232,800	12,152,590	12,268,135
Copper production, pounds	4,984,367	9,300,695	9,681,706
Gross proceeds	\$658,602	\$1,192,425	\$1,662,142
Expenditures at mine	364,093	495,655	529,668
Smelting and miscellaneous	60,236	105,033	99,729
Construction and lands	264,678	34,496	35,968
Net mining profit.....	—30,405	591,736	996,776
Interest received	6,731	6,679	11,044
Total net profit	—23,674	557,240	1,007,820
Dividends	240,000	390,000	840,000
Balance.....	—263,674	+167,240	+167,820
Rock hoisted, tons.....	213,650	328,412	355,339
Rock stamped, tons.....	187,482	314,091	341,820
Yield of rock treated per ton, lbs.	26.590	29.610	28.320
Cost per ton of rock hoisted	\$ 1.700	\$ 1.510	\$ 1.490
Cost per ton of rock stamped .....	.940	1.580	1.540
Cost per pound of refined copper at mine, cents.....	7.304	5.329	5.470
Cost of smelting and miscellaneous, cents	1.208	1.129	1.030
Total cost of refined copper, including construction, per pound, cents	13.820	6.869	6.760

The mine was opened, 1882, by local capital, but was not successful, and the company was reorganized, 1890, with the present title and management, when new machinery was secured and work resumed. The previous ill-success of the mine rendered investors dubious of its future, and cash for its development was secured with difficulty. Lack of funds imperatively demanded for the operation of the property was met by Mr. John Stanton, with

a heavy loan, advanced from his own pocket, at a time when other shareholders were unwilling to risk a dollar, and it is due to Mr. Stanton's courage that the Wolverine now is, in proportion to its size, the most profitable copper mine in the Lake Superior district. Under Mr. Stanton's management milling was discontinued immediately, and was not resumed until 18 months of underground development had given adequate reserves of stamp-rock. By reason of the sound policy pursued, the mine began making small profits from the time that stamping was resumed, in 1892, and ever since has enjoyed a steady growth in productive capacity and earning power.

Lands, 280 acres owned in fee, and 40 acres of adjoining mineral rights, giving 3,100' of the outcrop of the Kearsarge amygdaloid bed, on which the mine is opened. The neighbors of the Wolverine are the North Kearsarge on the north, Mayflower on the east, Mayflower and South Kearsarge on the south and Centennial on the west. The lode averages about 16' width, with an average dip of 41°, and is bunchy, but carries the best average values of any amygdaloid mine in the Lake Superior district, returning 28 to 30 lbs. fine copper per ton of rock stamped, as compared with 16 to 17 lbs. only, in 1892.

The mine has 4 shafts, numbered from north to south. No. 1, near the North Kearsarge line, ran into the boundary at shallow depth, and tributary ground was worked out and the shaft abandoned some years ago.

No. 2 shaft, permanently bottomed at 1,700', is used exclusively for handling men and material. Stringers are being replaced by cross-ties, similar to those on the roadbed of a railway, following the plan of the Calumet & Hecla, and eventually cross-ties will replace stringers in shafts 3 and 4.

No. 3 shaft, sunk in the footwall, is circa 2,800' deep, and can be sunk to 4,300' depth, owing to exchange of lands with the North Kearsarge mine of the Osceola. In this shaft stoping is in progress on the 12th to 24th levels, inclusive. The wooden shaft-rockhouse at No. 3 was burned, March, 1906, and has been replaced by a new steel structure, which is a duplicate, in design and equipment, of the shaft-rockhouse at Mohawk No. 4 shaft.

No. 4 shaft, 2,600' deep, is sunk 45' in the footwall, a wise provision that guards the shaft against the serious dangers threatening all deep shafts of the Lake Superior district that are sunk on the cupriferous beds, which lack the strength of the alternating strata of solid trap. In No. 4 stoping is in progress on the 6th level, and from the 11th to 24th levels, inclusive. A new stone engine-house is being built for No. 4, and this will have a winding engine duplicating that at Mohawk No. 4 shaft. The new hoist will be a 24x60" Nordberg, duplex-cylinder engine, with double conical drum of 18' maximum diameter, capable of raising 4-ton skips from one mile depth, and will serve the shaft for its ultimate depth of 4,400'.

Owing to the uniformity of the copper-bearing bed, all levels from the first to the 23d, inclusive, are opened though, connecting with all four shafts to depths of Nos. 1 and 2, and with the Nos. 3 and 4 only below the 17th level, those being the only shafts deeper than 1,700'. Man-cars are installed at shafts 2, 3 and 4. The mine employs 27 power drills, of which 18 are stoping

and 9 sinking and drifting. Notwithstanding only one-third of the drilling capacity being employed on opening work, the mine is fully opened for about 6 years' production, at the present rate of circa 10,000,000 lbs. fine copper yearly. About one mile of new openings are made yearly, and the mine has about 25 years of life remaining, at the present rate of output.

Lying about 80' west of and parallel with the Kearsarge bed is the West lode, opened by a crosscut on the 11th level. A little work was done on the West lode in 1903, and one excellent stope was opened, but the prospects of making a paying mine on this bed are not especially bright, as it would be contrary to all precedent were two parallel beds so close together to be found payable. An exploratory crosscut, on the 14th level, driven 2,000' across the formation, both east and west from the workings on the Kearsarge bed, reached as far west as the Kearsarge conglomerate, which was absolutely barren, where cut. The west lode gave a little encouragement in the 14th level crosscut, and may be tested further. The Kearsarge conglomerate carries some copper on the Ahmeek and Seneca properties, to the southward.

A new system of underground rock-handling is proving an unalloyed success. By this plan, an average of 10 tram-cars is kept on each level. Trammers leave the full cars at the shaft, and 2 men attend to the dumping in each shaft. These men start at the topmost level where stoping is in progress, and work downward, dumping all the loaded cars on each level, in order, then ride up, to the topmost producing level, on the skips, and repeat the process already described. By this simple system all signalling in each shaft is in the hands of two men, the engineers in charge of the hoists know exactly what is going on underground, much confusion is saved, the trammers lose no time at the shafts, and perfect order reigns. Simple as this little plan may seem to a layman, it will appeal strongly to mine managers throughout the world, and is certain to come into general use, eventually, in most mines with inclined shafts and heavy production, where underground ore-bins are not employed.

Surface equipment is well adapted to present and future needs, the principal buildings being at No. 4 shaft. The boiler-house, at this point, has 3 Stirling water-tube boilers, an American automatic stoker, and a Green fuel economizer. The Rand air-compressors are of 20-drill and 22-drill capacity. No. 3 shaft has a model changing house, much appreciated by the miners. The hoists at shafts 2 and 3 have straight-face drums and duplex cylinders. The shafthouses are substantial and equipped with necessary crushing machinery. A private telephone system reaches the underground pump-stations and the principal buildings on surface. The company owns a large number of good dwellings, and the mine location is exceptionally neat and prosperous in appearance.

Rock goes to the mill over the Mohawk & Traverse Bay railroad, with a down-grade haul of 13 miles. The mill, completed 1902, is near the mouth of the Tobacco river, on Traverse Bay, Lake Superior, and adjoins the Mohawk mill, both being served by a single pump and managed by a joint superintendent, this arrangement allowing considerable operating economies. The mill,

of steel, on stone foundations, 180x206' in size, stands 37' above lake level, giving a good drop for tailings, with ample room for sands. There are 2 Nordberg heads, striking about 110 blows per minute, with a capacity of about 550 tons daily, each. The mill has a full complement of jigs and makes extensive use of Wilfley tables. Mineral from the heads and wash is sluiced to the basement through iron pipes, and is sent for reduction to the works of the Michigan Smelting Co., at Houghton. The boiler-house, just south of the mill, is 42x58', with stone walls and steel truss roof, housing a battery of 200-h. p. Stirling water-tube boilers, fitted with automatic stokers. Coal goes through a lump-crusher, thence to hoppers having 24 hours' storage capacity. A completely appointed machine shop is maintained in connection with the mill. A 20,000,000-gallon horizontal triple-expansion Snow pump, owned and operated jointly by the Wolverine and Mohawk, has steam cylinders of 18", 33" and 54" diameter, and 22" water plungers with 36" stroke, and is to be aided by an 8,000,000-gallon Nordberg pump with triple-expansion water-end and 3 plungers. The pump-house is located on the river, near its mouth, the intake pipe being protected by timber cribs running 300' into the lake, to prevent clogging from floating bark and anchor ice. The coal and merchandise wharf, owned jointly by the mines, is near the mill, and is fitted with coal-hoists. A 40-acre townsite, platted near the mills, is named Gay, in deserved honor of Jos. E. Gay, the president of the company.

The death of John Stanton, Feb. 23, 1906, deprived the Wolverine, not only of its president, but of the father of the property. But for his fostering care, at a critical period, the Wolverine would be today a property twice discredited by failure, instead of a mine that netted a million dollars cash in the fiscal year ending June 30, 1906. Fortunately the management of the company remains in the hands of the men who have been closely associated with Mr. Stanton for many years past, and the policy will be absolutely unchanged.

Production, for the calendar year 1905, was 9,464,418 lbs. fine copper, and for the fiscal year ending June 30, 1906, was 9,681,706 lbs., compared with 9,729,971 lbs. for the preceding fiscal year, a decrease of 48,265 lbs., equivalent to almost exactly one-half of one per cent. The Wolverine has but two productive shafts, and the use of one of these was lost, for the last four months of the fiscal year, yet production was maintained by the single shaft. This means that the Wolverine mine is capable of making twice its present output, if desired, by doubling the milling facilities, but no movement toward such increase has been made. The management of the Wolverine, both general and local, is as nearly perfect as that of any mine in operation.

WOLVERINE MINE.

COLORADO.

Owned by Coldwater Copper Mining Co.

WOLVERINE MINING CO.

UTAH.

Office: Superior Savings Bank Bldg., Hancock, Mich. Letter returned unclaimed from former mine office, Park City, Summit Co., Utah. Capitalization, \$150,000, shares \$1 par. Chas. A. Wright, president; Martin L. Effinger, vice-president; Lewis A. Jeffs, managing director. Lands, 11 claims,

area circa 125 acres, about one-half mile south of the Daly Judge, in the Snake Creek district, developed by tunnel, with about one mile of underground openings, showing 6 veins of 1' to 6' width, carrying auriferous and argentiferous sulphide ores of lead and copper, averaging \$8 to \$10 per ton, mine-run, with occasional antimonial silver, assaying as high as 564 oz. per ton, and with considerable shipping ore, carrying values from \$50 up to \$80 per ton. Working tunnel has cut 2 ore bodies, one a 2' vein carrying 4% copper, 4% lead and 80 oz. silver per ton. Idle.

WOLVERINE MINING & LEASING CO.**COLORADO.**

Office: care of Dr. Z. L. Baldwin, president, Niles, Mich. Mine office: Pearl, Larimer Co., Colo. Burr T. Lobdell, treasurer and chairman of executive committee. Is a development company, composed of shareholders of the Coldwater Copper Mining Co., and is operating the Coldwater copper mine, under a three to five year lease.

WOLVERINE & WESTERN MINING CO.**OREGON.**

Office: care of James T. Fisher, president, Calumet, Mich. Dr. D. K. McQueen, vice-president; Frank J. Kohlhaas, secretary and treasurer; Capt. Thos. Buzzo, superintendent; preceding officers, Johnson Vivian, Jr., Wm. Harris and Geo. Hall, directors. Organized circa 1905, under laws of Arizona, with capitalization \$100,000, shares \$10 par.

Lands, 8 claims, area 160 acres, held under option expiring March 31, 1907, in Coos and Douglas counties, Oregon, 18 miles from a railroad, 45 miles from Roseburg and circa 50 miles north of Grants Pass, in an absolutely new district, where no mining has been attempted previously. Country rocks are granite and porphyry, showing an 18' vein carrying chalcopyrite, giving average assays of 15.7% copper, and a vein carrying a 40" paystreak of massive bornite, assaying 40% to 60% copper. Development is by a 150' tunnel, cutting both veins, and a second tunnel was started, 1906. Equipment includes power drills. Management plans pushing work vigorously, and property is considered decidedly promising.

WOOD RIVER GOLD & COPPER CO.

Letter returned unclaimed from former office, Scranton, Pa. Organized 1902, under laws of Delaware, with capitalization \$1,000,000, by W. W. Watson, et al.

WOODSIDE-EUREKA MINING CO.**CALIFORNIA.**

Office: Bacon Blk., Oakland, Cal. Mine office: Georgetown, El Dorado Co., Cal. W. E. Everson, superintendent. Organized circa 1906, as a reconstruction of El Dorado Copper Mining Co., with capitalization \$500,000. Lands, sundry quartz and placer claims, area circa 200 acres, including the Eureka and Woodside mines, with principal development on the Eureka, which has shafts of 100' and 250' depth. Lands are said to carry gold, copper and asbestos. The prospectus of the old company contained a vast amount of varied misinformation.

WOOLLEY MINING CO.**ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Lands, 17 claims, between the Saddle Mountain and Troy-Manhattan, held under a \$60,000 bond and lease.

WORLD'S FAIR MINE.**ARIZONA.**

Office: care of Frank Powers, owner, Nogales, Ariz. Lands, sundry claims, near Harshaw, in the eastern end of the Salero Mountains, Patagonia district, Santa Cruz county, Arizona. The mine is said to have circa 2 miles of workings, deepest 550', on an 8' ore body, showing mainly lead carbonates and sulphides, carrying good silver values near surface, changing principally to auriferous copper sulphides at depth. Property has been a shipper of high grade ores, in carload lots, for some years, ores ranging in value from \$250 to \$350 per ton, one carload of 20 tons netting \$15,000, and is popularly reputed to have produced upwards of \$500,000.

WRIGHT & LAWRENCE MINING CO.**CALIFORNIA.**

Office: 8 Jackson Blvd., Chicago, Ills. Eric Forsell, president; R. M. Smith, secretary; A. W. Linquist, general manager. Lands, 16 claims, area 320 acres, in the Doyle district, Riverside county, California. A rotten stock-jobbing concern.

WRIGHT-RUSSELL COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Battle, Wyo.

WYACCA MINE.**AUSTRALIA.**

Office: care of E. Pearce, Broken Hill Chambers, Adelaide, South Australia. Lands are in the Hundred of Basedow, in the Flinders range, 8 miles southwest of the Blinman mine, and about 260 miles north of Adelaide. Vein ranges 1" to 26" wide, carrying cuprite, melaconite and chalcopyrite, in a gangue of calcespar and spathic iron. Idle at last accounts.

WYANDOT COPPER CO.**MICHIGAN.**

Office: 68 Devonshire St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. Henry Stackpole, president; Irving J. Sturgis, vice-president; Wm. O. Gay, secretary and treasurer; preceding officers, Joseph Dorr and Mathew Van Orden, directors; Frank L. Van Orden, superintendent. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; paid in, \$9. On April 1, 1906, had a cash balance of \$18,213, with \$28,263 accounts receivable, and a net surplus of \$49,408, with \$14,408 due the company on assessments. Old Colony Trust Co., Boston, registrar. Annual meeting, first business day of May.

Lands, 1,040 acres, adjoining the Winona, in Sections 16, 20 and 21, Town 52 North, Range 36 West, Houghton county, Michigan. Tract is crossed by the Copper Range railroad. Exploratory work, begun February, 1899, has been continued uninterruptedly, though hampered by the great disadvantage of a heavy overburden. Early work was done in search of the Winona lode, and efforts were made later to locate the southern extension of the Baltic amygdaloid, but attention was again turned to the Winona lode.

No. 1 shaft, circa 600' deep at end of 1905, is on the Winona lode, with a parallel underlying amygdaloid bed 60' distant, both broken and of little promise, though showing occasional patches of well-mineralized ground. It is planned to sink to a depth of 1,000' and then drift on the lode. The shaft is in the footwall and the lode is reached by crosscuts therefrom. Shaft No. 11, about a quarter-mile from No. 1, and 100' deep, shows a disturbed and unsatisfactory

formation, with parallel amygdaloids 50' apart, these giving only occasional bunches of good ground. A 102' shaft was sunk on a lean cupriferous conglomerate underlying the Winona bed, and a 300' shaft sunk on an amygdaloid identified as the Elm River gave no promising ground. A crosscut was sent eastward, 1904, to the Eastern Sandstone, and also several hundred feet westward, cutting several amygdaloids carrying copper in small quantities, on which a little drifting was done, but nothing of promise found. It is thought that the Baltic lode was one of the amygdaloids located in the western crosscut, but the lode in question was very wide, and void of copper. Some work was done, September, 1904 to April, 1905, on the Misery River lode, in Section 16, Town 52 North, Range 36 West, on a 20' amygdaloid carrying fine copper, but nothing of value was developed. In addition to opening work, extensive diamond drill borings have been made, but results have been of a negative nature. To date the Wyandot has found nothing workable, but operations are being continued, along well-considered lines, and the property will not be abandoned until it has been given an exhaustive test. The geological conditions of the Lake Superior copper district are such that a vast amount of work is necessary to thoroughly exhaust the possibilities of any given tract, and the management is following the only correct plan by continuing its exploratory work. Surface improvements include machine and blacksmith shops, warehouse, barns, and about 12 dwellings, with boilers, hoists, shop machinery and tools.

WYOMING & ALABAMA MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Tie Siding, Wyo.

WYOMING & COLORADO COPPER CO.**COLORADO & WYOMING.**

Said to have lands in the Douglas Mountains, 125 miles south of Rock Springs, Sweetwater county, Wyoming.

WYOMING CONSOLIDATED COPPER CO.**WYOMING.**

Letters returned unclaimed from former office, 27 State St., Boston, Mass., and former mine offices, Encampment and Collins, Wyoming.

WYOMING COPPER CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Lands were on upper Cow Creek.

WYOMING COPPER & GOLD MINING CO.**WYOMING.**

Office: Alma, Kansas. C. B. Henderson, manager, at last accounts.

WYOMING COPPER & MINING CO.**WYOMING.**

Office: 115 Dearborn St., Chicago, Ills. Mine office: Rawhide Buttes, Larimer Co., Wyo. Employs 10 men. Mark E. Bennett, president; Edwin Hall, vice-president and general manager; W. M. Gager, secretary. Organized November 17, 1905, under laws of Wyoming, with capitalization \$500,000, shares \$1 par; issued, \$206,400. Annual meeting, fourth Monday in November. Lands, 35 claims, area 700 acres, in the unorganized Rawhide Buttes district, also 100 acres of timber lands, showing country rocks of quartzite, schist and limestone, carrying 14 contact veins, of which 4, of 5' average width, are opened by shafts of 30' and 245', showing malachite and azurite above, with sulphides in the lower workings, giving average assays of 8% copper, 4 oz. silver and \$3

gold per ton. Mine has 810' of workings, estimated to show 20,000 tons of ore. Equipment includes a 40-h. p. steam plant, with hoist and 4-drill air-compressor, and 4 mine buildings. Nearest railroad is the Chicago & Northwestern, 12 miles distant. Company plans continuous development, during 1906.

WYOMING MINING CO.**WYOMING.**

Mine office: Kirwin, Big Horn Co., Wyo. Titus Sheord, president; B. F. Brown, secretary; C. A. Tewksbury, superintendent. Ores carry copper, silver and gold values. Presumably idle.

WYOMING QUEEN MINING CO.**WYOMING.**

Office: Laramie, Wyo. Mine office: Jelm, Albany Co., Wyo. Louis Miller, president, treasurer and general manager; L. A. Hancock, secretary; preceding officers, C. F. Downing, E. E. Fairbrother, Ole Scar and John Wenzin, directors. Organized January, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 18 claims, area 360 acres, in the Jelm Mountains, 32 miles southwest of Laramie, the nearest railroad station, showing 3 fissure veins, carrying auriferous and argentiferous carbonates and sulphides, of good assay values, with a little native copper and galena. Development is by shafts of 70', 70' and 100', on a gold vein, a shaft of 100' on a vein carrying auriferous and argentiferous copper and lead sulphides, and a 250' shaft on an auriferous copper vein, the mine also having tunnels of 70' and 250'. Mine is wet, and needs pumps. Equipment includes a 6-h. p. gasoline hoist and several small buildings. Idle, at last accounts, through lack of funds.

WYONA IRON & COPPER CO.**WYOMING.**

Office: 928 Equitable Bldg., Denver, Colo. Mine office: Battle, Carbon Co., Wyo. Geo. E. Ross-Lewin, president; H. A. McIntyre, secretary and treasurer. Capitalization \$2,000,000, shares \$1 par. Lands, 16,380 acres, in 4 groups, in Wyoming, carrying iron and copper ores, coal, and indications of oil. Presumably idle.

COMPAÑIA MINERA YABRICOYA.**CHILE.**

Mine office: Iquique, Tarapacá, Chile. Property is the Aguada copper-silver mine, in the vicinity of Iquique.

YACO GROUP.**BRITISH COLUMBIA.**

Sundry idle claims, near Lynn Creek, Vancouver Island, British Columbia. Ore is chalcopryite, associated with iron pyrites and pyrrhotite, assaying circa \$4 gold per ton, with small silver values.

YADKIN CONSOLIDATED MINING CO.**NORTH CAROLINA.**

Organized 1903, under laws of North Carolina, with capitalization \$1,000,000, to develop copper lands in that state. No trace of operations.

YADKIN MINING & IMPROVEMENT CO.**NORTH CAROLINA.**

Office: 508 Herman Bldg., Milwaukee, Wis. Lands are in Yadkin county, North Carolina. Presumably idle.

YADKIN & VIRGILINA COPPER & LAND CO.**NORTH CAROLINA.**

Organized 1903, under laws of North Carolina, with capitalization \$750,000, to develop copper properties. No trace of operations.

YAEGER CAÑON COPPER CO.**ARIZONA.**

Office: Union Trust Bldg., Detroit, Mich. Mine office: Prescott, Yavapai Co., Ariz. Robert E. Plumb, president; Richard E. Sloan, vice-president and general manager; Geo. B. Russell, secretary; Geo. H. Russell, treasurer; C. E. Brinker, superintendent. Organized April 11, 1903, under laws of Arizona, with capitalization \$800,000, shares \$1 par. Lands, 21 claims, area 460 acres, in the Black Hills district. Formation is diorite and slate, showing three principal ore bodies, occurring as fissures in diorite, of which one, averaging 14' width, is developed by shafts of 350' and 900', with about one half mile of underground openings, estimated to give 40,000 tons of ore in sight, with about 25,000 tons blocked out for stoping, ore being bornite and chalcoppyrite, averaging 6% copper, 8 oz. silver and \$2 gold per ton. Property has a 240-h. p. steam plant, with a 140-h. p. hoist, good for 3,500' depth, and a 10-drill Sullivan air-compressor. A 60-ton concentrator, 30x104', of wood and iron, has a No. 2 Austin centrifugal crusher, 2 trains of rolls and 5 Wilfley and Bartlett tables. Production, 1904, was 4,000 tons of ore, averaging 6.5% copper. Shipments were changed, 1906, to the Humboldt smelter. Management seems good and property is regarded as promising.

YALE GOLD-COPPER MINING CO.**BRITISH COLUMBIA.**

Presumably dead. Had lands, circa 1896, near Roseland, Yale district, British Columbia.

YAMATE MINE.**JAPAN.**

Mine office: Takigawa-mura, Kume-gori, Mimasaka, Japan. Is a very old property. Ore is slightly argentiferous chalcoppyrite, associated with iron pyrites, galena and sphalerite, with arenaceous clay gangue, occurring in quartz-diorite. Best grade of ore yields 10% to 13% copper. Production, 1899, was 3,044 momme silver and 99,679 lbs. fine copper.

YAMPA MINE.**UTAH.**

Owned by Tintic Mining & Development Co.

YAMPA SMELTING CO.**UTAH.**

Office: 214 Dooly Bldg., Salt Lake City, Utah. Works office. Bingham Canyon, Salt Lake Co., Utah. Henry Stern, president; Geo. H. Robinson, general manager; James W. Neill, superintendent. Organized 1903, with capitalization \$100,000, as a subsidiary corporation of the Tintic Mining & Development Co.

Property is a smelter, built 1904 and enlarged 1906. Buildings are of structural steel, and plant is modern in design and equipment. Smelter includes 2 blast-furnaces, 2 reverberatory furnaces and 6 calciners, having a daily capacity of circa 800 tons. The calciners, of 18' outside diameter, have 6 superimposed hearths, each with its sets of rabbling arms and rakes. Owing to the great quantity of fines contained in the Yampa ores, considerable trouble has been experienced in smelting. A converter may be added shortly. Production of the works, 1905, was 4,069,886 lbs. fine copper, from Yampa ores.

YANCEY MINE.**NORTH CAROLINA.**

An old and idle mine, in Person county, North Carolina. Main vein

ranges 6' to 14' wide, showing tetrahedrite carrying 1 oz. to 7 oz. silver and circa \$2 gold per ton.

**YANKEE CONSOLIDATED MINING, MILLING
& TUNNELING CO.**

COLORADO.

Mine office: Yankee, Clear Creek Co., Colo. Henry I. Seeman, manager, at last accounts. Lands include the Polaris, Lombard and other properties, carrying auriferous and argentiferous lead and copper ores. Has steam power and a 5-stamp mill.

YANKEE MINING CO.

UTAH.

Mine office: Eureka, Juab Co., Utah. B. N. Lehman, superintendent. Ended 1905 with a cash balance of \$68,322. Has argentiferous lead and copper ores, principal values being in lead and silver. Company is said to plan building a concentrator, to treat milling ore.

YAQUI CANYON COPPER CO.

MEXICO.

Office: 408 Gumbel Bldg., Kansas City, Mo. Mine office: Sauqui de Batuc, Ures, Sonora, Mexico. Employs 10 to 15 men. A. J. Davies, president and general manager; S. M. Major, vice-president; Frank B. Foster, secretary and treasurer; T. W. Foster, superintendent; preceding officers, C. S. Bone and Wm. Herbert Collins, directors. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$1 par; issued, \$1,800,000. Annual meeting, second Tuesday in January.

Lands, 60 pertenencias, area 148 acres, with applications made for a 50-acre smelter-site and 5,000 acres of timber lands. Country rock is limestone, showing porphyry intrusions carrying 6 main contact veins, of which 2, under development, are estimated at 10' average width, showing a variety of ores, giving average assays of 7% copper and 50 oz. silver from the copper veins, and 15% lead and 30 oz. silver, with a trace of gold, from the lead veins. Property is a antigua, supposed to be circa 300 years of age, showing considerable ore on the dumps, from ancient operations. It is planned to reopen the mine by a tunnel, to crosscut all known veins.

Management plans building a 10-ton reverberatory smelter, to treat the high grade oxidized ores, estimated by company to range from 10% to 25% copper and 100 oz. to 400 oz. silver per ton, with average value of circa \$75 per ton. Property is some distance from a railroad, but the surveyed line for the extension of the Cananea, Rio Yaqui y Pacifico passes only 2 miles from the mine.

YAQUI COPPER CO.

MEXICO.

Office: 170 Broadway, New York. Mexican general office: Hermosillo, Sonora, Mexico. Mine office: Sauqui de Batuc, Ures, Sonora, Mexico. Wm. Sauntry, president; John M. Thurston, vice-president and general counsel; Geo. E. Green, secretary and treasurer; Robt. B. Brown, general manager; Ed. Chamberlain, superintendent. Organized 1902, under laws of West Virginia, with capitalization \$5,000,000, shares \$1 par. Is said to have a floating debt.

Lands, originally were, or were claimed to be, 6,032 acres of mineral lands and 119,284 acres of timber and grazing lands, also water-rights to 25 miles

of the Yaqui river; mining lands being in the vicinity of Suaqui de Batuc, Campo Santo Niño, Sonora, Mexico, in the Sierra Madre Mountains, circa 120 miles from Hermosillo. Property is claimed to show antigua workings, iron ore and indications of coal. In June, 1906, the Montana de Cobre company was said to have acquired 1,000 pertenencias formerly held by the Yaqui Copper Co., hence present holdings are uncertain.

The Yaqui Co. apparently was a deliberate swindle, promoted solely for the purpose of selling stock, and the lying done by the original officers was of a monumental nature. The company claimed possession of the largest copper vein ever located, but has been unable to produce the same, for the inspection of visitors competent to judge of values. The writer was saved a long trip to this property, through the hostile Yaqui country, several years ago, by fortunately meeting, in Arizona, a miner, fresh from this property, who, in answer to an inquiry as to the force employed, replied "six miners and six typewriters."

The president of the company, Mr. Wm. Sauntry, is an experienced lumberman, and a fine judge of pine timber. The secretary and treasurer makes good time-recording machines, even if he did get mixed up with some scandals in the United States postal department. The superintendent is said to have managed a photograph gallery, with great success, for several years. One Gen. Henry I. Willie, a consulting engineer, who is still extant, was responsible for a good share of the prevarication done about this property.

YAQUI RIVER EXPLORATION CO.

MEXICO.

Letter returned unclaimed from former office, Colorado Springs, Colo. Mine office: San Antonio de la Huerta, Sonora, Mexico.

YAQUI RIVER LAND & DEVELOPMENT CO., LTD.

MEXICO.

Offices: 3, Bank Bldg., Lothbury, London, E. C., Eng. T. Morriss, secretary. Organized Jan. 29, 1900, with capitalization £40,000, shares £1 par. Lands, 87,000 acres, near Guaymas, Sonora, Mexico. Idle.

YAQUI SMELTING & REFINING CO.

MEXICO.

Works office: San Antonio de la Huerta, Sonora, Mexico. F. Davis, general manager; Geo. P. Hyde, superintendent, at last accounts. Property is a smelter, 80 miles east of Torres and 60 miles below Campo Santo Niño, circa 20 miles from nearest railroad. Plant, furnished by the Allis-Chalmers Co., is variously reported, at 125 tons to 250 tons nominal daily capacity, and includes a blast-furnace, specially designed to reconcentrate smelt and refine ores of silver, lead and copper. In October, 1905, the company was considering changing over to a reverberatory smelter. Equipment includes a 2-story sampling mill, machine-shop, electric light plant and ice plant. The claim of the company, that it could not find a competent metallurgist to operate the plant, is a weak excuse, as there are many competent men to be had, and the trouble seems to be with the company, rather than with the plant. This is the first and only custom smelter in Sonora, and is surrounded by a rich mineral district, but adequate transportation facilities are utterly lacking, and the plant is operated under great difficulties, owing to depredations of the Yaqui Indians.

SOCIEDAD YAURICOCHA, LIMITADA.**PERÚ.**

Office and mine: Huaripampa, Yauyos, Perú. Was a small producer of argentiferous copper ores, at last accounts.

YAVAPAI COPPER CO.**ARIZONA.**

Office: 317 Main St., Springfield, Mass. Mine office: Prescott, Yavapai Co., Ariz. Geo. Nightingale, president; Frederick Carpenter, secretary. Organized, circa 1900, with capitalization \$1,000,000, shares \$10 par. Lands, 25 claims, area 500 acres, about midway betw. en Prescott and Jerome. Idle for several years, deeply involved in debt, and practically moribund.

YAVAPAI DEVELOPMENT CO.**ARIZONA.**

Letter returned unclaimed from former office, Calumet, Mich. Mine office: care of E. A. Haggott, superintendent, Mayer, Yavapai Co., Ariz.

NEGOCIACION MINERA DE CLEMENTE YBARRA.**MEXICO.**

Mine office: Promontorios, Sonora, Mexico. Don Clemente Ybarra, owner; Jesús Maria Quijada, manager. Property includes the Almada y Terito, Alvarado and Gloria mines, carrying gold, silver and copper ores, developed by shafts and tunnels. Has 2 small smelters. Production, 1903, was 9,200 kgs. fine copper from La Valenciana smelter, and 8,000 kgs. copper from the Almada y Terito smelter. Employed circa 50 men, at last accounts.

YELTA MINE.**AUSTRALIA.**

Owned by Paramatta Copper Mines, Ltd.

YENISEI COPPER CO., LTD.**SIBERIA.**

Offices: 65, Gracechurch St., London, E. C., Eng. Mine office: Abakansk, Yenisei, Siberia. T. E. Hurst-Hodgson, chairman; J. D. Kendall, consulting engineer; E. L. Edmonds, mine manager; P. J. Brenchley, secretary. Organized Apr. 21, 1902, with capitalization £300,000, shares £1 par; issued, £182,007. Debentures, £5,869 outstanding. Lands include mineral leases of 8,500 acres, and timber rights over 470,000 acres, in the province of Yenisei, Siberia. Is opening two mines, which are said to average 5% copper, and contemplated erection of a smelting plant. The Julia mine is said to show reserves of 42,000 tons of 5% ore. Idle from lack of funds.

YORK HARBOUR COPPER CO., LTD.**NEWFOUNDLAND.**

Wound up, February, 1902. Lands sold to Humber Consolidated Mining & Manufacturing Co.

YORK HARBOUR MINE.**NEWFOUNDLAND.**

An idle property, at Birchy Cove, Bay of Islands, Newfoundland. Lands, 4 claims, area 6,400 acres, also 26,880 acres of timber lands, giving total holdings of 33,280 acres, on the west coast of Newfoundland. Country rocks are diorite, with 12 known fissure veins in serpentine, of which 5, including one of 50' width, have been more or less developed, these showing cupriferous iron pyrites, claimed to carry 3% to 18% copper, occasional zinc, up to 50% sulphur, 0.5 oz. to 4 oz. silver and 40 cents to \$1.40 gold per ton. Development is by shafts of 54', 64', 70' and 400', with circa 2,000' of underground workings. Mine was discovered circa 1870, but active development was not begun until 1900. Equipment includes a 250-h. p. steam plant, with 5 hoists, an 8-drill Norwalk air-compressor, engine-house, boiler-house, sawmill and

15 dwellings. Mine has a crusher, of 300 tons daily capacity, and a substantial wharf, on a good harbor, connected with the mine by a 5,000' ground-tram, and is 14 miles distant from the Newfoundland railway. Was last held by Humber Consolidated Mining & Manufacturing Co. Presumably idle.

YOSEMITE COPPER MINING & REDUCTION CO.**CALIFORNIA.**

Office: 214 Potomac Bldg., Los Angeles, Cal. Mine office: Daulton, Madera Co., Cal. J. M. Hamblen, president; I. N. Richards secretary. Has 4 parallel veins, carrying auriferous and argentiferous copper ores, opened by an 80' shaft. Has steam power. Presumably idle.

YOSHIOKA MINE.**JAPAN.**

Owned by Mitsu Bishi Goshji-Kwaisha.

YREKA COPPER CO.**BRITISH COLUMBIA.**

Office: 515 Fidelity Bldg., Tacoma, Wash. Mine office: Yreka, Vancouver Island, B. C. C. W. Riddell, president; C. D. Lynn, vice-president; S. T. Lewis, secretary and general manager; N. S. Clarke, general superintendent; W. C. Spicer, treasurer. Organized 1901, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Lands, 16 patented claims, on Comstock Mountain, Quatsino Sound, Vancouver Island, including the Comstock and Superior groups, also 3 unpatented claims, in the Victoria district, 2 miles from tidewater, on the eastern side of the island, this latter group, known as the Yreka, being idle. The Superior group has an enormous contact vein, claimed to show a 200' outcrop, developed by 3 tunnels and an open-cut, disclosing a large body of auriferous and argentiferous sulphide ore, estimated by company to carry average values of 7% copper, 2 oz. silver and \$3 gold per ton. Amount of ore in sight is variously estimated at 2,000,000 to 4,000,000 tons, with perhaps 500,000 tons available for stoping, which undoubtedly is an over-estimate. The mine has a 10-drill air-compressor, with direct-connected Pelton wheel. A 3,600' Riblet aerial tram, of 600 tons daily capacity, leads to a fine wharf having a 2,500-ton ore-bunker. There also are two smaller aerial trams, of 400' and 800' length. The company contracted to ship 100,000 tons of ore to the Crofton smelter, on the strength of which contract the smelter people advanced considerable sums, and mined about 2,500 tons, 1903-04. Management is considered honest and property promising, but company's finances are in very unpromising condition, and property has been idle for several years.

YTTEROEN MINE.**NORWAY.**

A Norwegian mine that shipped 1,300 tons of cupriferrous pyrites in 1900.

YUDA COPPER CO., LTD.**AUSTRALIA.**

Still-born. Company did not go to allotment.

SYNDICAT DU YUNNAN, LTD.**CHINA.**

Offices: 404, Salisbury House, London, E. C., Eng., and 32, Rue Louis Le Grande, Paris, France. Achille Adam, president; G. T. Frost, secretary in London; G. de Maroussem, secretary in Paris; Consul-general E. Rocher, agent in China. Organized Oct. 17, 1899, as the Anglo-Foreign Syndicate, name changed, 1900, to present title, with capitalization £35,000, in 34,875

£1 ordinary shares and 2,500 deferred 1s. shares. Has a government concession, for 85 years, to exploit mineral deposits and incidentally built railways, canals, etc., in 7 districts of the province of Yunnan, China, on a royalty of 35% to the Chinese government, payable after deduction of 28% of net earnings for interest, sinking fund, and reserve. Inactive.

YUSPENSKI MINE.**SIBERIA.**

Owned by Spassky Copper Mine, Ltd.

ZACATECAS & DURANGO MINING & SMELTING CO.**MEXICO.**

Letter returned unclaimed from former office, Los Angeles, Cal. Works office: Chalchihuites, Zacatecas, Mexico. Organized, 1905, to take over sundry independent plants, including a 60-ton concentrator and 40-ton smelter.

ZAMBESIA EXPLORING**RHODESIA & PORTUGUESE EAST AFRICA****CO., LTD.**

Offices: 30, Clements Lane, London, E. C., Eng. Tyndale White, chairman; Robert Williams, managing director; J. R. Farrell, consulting engineer; L. Scotland, secretary. Organized March 26, 1891, with capitalization, £40,000, increased, 1892, 1893, 1897, 1898, 1900, 1903 and 1905, to present figure of £450,000, shares £1 par; issued, £439,645. Lands, sundry mining claims, in Rhodesia, including copper claims in the Lomogunda district, 60,000 acres of farm lands, and extensive share interests in various South African and East African mining and industrial corporations.

COMPANHIA DA ZAMBEZIA.**PORTUGUESE EAST AFRICA.**

Offices: 53, Rua do Alecrim, 1a, Lisbon, Portugal and 10, Rue Lafayette, Paris, France. Organized May 20, 1892, under Portuguese royal decree, with capitalization 2,700 contos do reis, shares 4,500 reis (£1) par; issued, 2,025 contos do reis. Property is a concession of 60,000 square miles, on either side of the Zambesi and Shire rivers, extending east of latter to the coast, and embracing the ports of Quelimane and Chinde, Portuguese East Africa. Concession includes copper-bearing fields of prospective value.

ZAMBONA DEVELOPMENT CO.**MEXICO.**

Mine office: Minas Nuevas, Alamos, Sonora, Mexico. Has ores carrying native silver, silver sulphides and argentiferous chalcocite. Planned starting milling circa September, 1905.

MINAS ZAPATERO y OTRAS.**MEXICO.**

Office and mine: care of E. G. Kaufman, Ayutla, Jalisco, Mexico. Lands, 60 pertenencias, opened by a 100' shaft and a 400' tunnel, with 2,000' of workings, showing 3 parallel veins of 5' to 18' average width, carrying ores assaying up to 10% copper, with gold and silver values. Erection of a reduction plant is under consideration.

COMPAÑIA MINERA ZAPOTECA.**MEXICO.**

Office: Laclede Bldg., St. Louis, Mo. Mine office: Ocotlán, Oaxaca, Mexico. Geo. T. Riddle, president; P. R. Fliteraft, secretary; Guillermo W. Thompson, general superintendent; F. J. Tayman, assistant superintendent. Organized January, 1903, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Lands, 33 pertenencias, area 81 acres, also 420

acres miscellaneous lands, in the Taviche district, including the Zapote mine, carrying auriferous copper and argentiferous lead ores, developed by a 400' main shaft and 300' tunnel. Has steam power, with a 30-h. p. Webster, Camp & Lane double-drum hoist, good for depth of 1,000'. Nearest railroad is the Ferrocarril Oaxaca y Ejutla, 8 miles distant.

ZARAGOZA COPPER & ZINC MINES, LTD.**SPAIN.**

Offices: 8, Union Ct., London, E. C., Eng. C. H. Crowther, secretary. Organized Nov. 14, 1900, (as Sarragoza Zinc Mines, Ltd., name changed to present title, January, 1901,) with capitalization £60,000, shares £1 par; issued, £9. Was formed to adopt an agreement with the Rio Tendio Copper Mines, Ltd., but agreement was not effected. Moribund.

COMPAÑIA MINERA ZAUCUDO.**COLOMBIA.**

Mine office: Medellin, Antioquia, Colombia. Juan de la Posado, superintendent. Operates the Zaucudo and Savalotas mines, producing gold, silver and copper. Has steam power and a smelter, employing several hundred men, at last accounts.

GEWERKSCHAFT DER ZECHE THALBURG.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Heiligenhaus, Rheinprovinz, Germany. Louis Zurhelle, president; H. Dressler, engineer. Has 2 shafts, developing sulphide ores of lead, zinc, copper and iron. Was working, in a very small way, at last accounts.

ZELLER ERZBERGWERKE G. m. b. H.**GERMANY.**

Mine office: Altlay bei Zell a/M., Rheinprovinz, Germany. R. Reiser, president. Produces cupriferous silver-lead ores, and employed circa 100 men, at last accounts.

ZELNORA MINE.**UTAH.**

Owned by Bingham-New Haven Copper & Gold Mining Co.

ZENITH GOLD & COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Organized, 1904, to develop claims on Purgatory Gulch, near lands of El Rey Gold & Copper Mining Co.

ZIMAPÁN MINING & SMELTING CO.**MEXICO.**

Office: 112 Fulton St., New York. Mine office: Zimapán, Hidalgo, Mexico. David Tim, trustee. Ended 1905 in financial straits, with claims exceeding \$100,000 filed by creditors, against assets of \$27,216. Is to be wound up.

ZOMEKI MINE.**JAPAN.**

Mine office: Ikuno-mura, Abu-gori, Nagato, Japan. Ores are slightly argentiferous chalcopyrite and bornite, associated with sphalerite, galena and pyrrhotite, occurring in lenses and fissure veins, near liparite dikes penetrating clay-slate, sandstone and limestone.

ZONIA COPPER MINING CO.**ARIZONA.**

Letter returned unclaimed from former office, 218 Tremont St., Boston, Mass., and from former mine office, Prescott, Yavapai Co., Arizona.

CHAPTER XVI.

GENERAL COPPER STATISTICS.

While more compact than in the earlier issues of this work, the present chapter of statistics will be found to contain more matter, and in somewhat better arrangement, as numerous tables have been consolidated, this work being carried, in some instances, so far as to put three and four into one. As a consequence of this process of consolidation, many of the tables will be found to give information upon two to a dozen points each.

All tables are fully indexed and cross-referenced, in the index of the entire book following this chapter, but the following condensed table of contents may be found to facilitate reference:

WORLD'S COPPER PRODUCTION: By Countries, For Nineteenth Century, By Largest Mines, By Various Mines, Estimate for 1905—pages 1075 to 1084.

AMERICAN COPPER PRODUCTION: By States—pages 1085 to 1086.

LAKE SUPERIOR COPPER PRODUCTION: By Mines, Production and Value, —pages 1086 to 1088.

AMERICAN IMPORTS: Page 1088.

AMERICAN EXPORTS: Exports, By Ports, By Destinations—pages 1089 to 1090.

COPPER TRADE OF THE WORLD: Detailed Tables by Countries—pages 1091 to 1095.

PRICES AND VALUES: Sundry Tables—pages 1096 to 1100.

DIVIDENDS, ASSESSMENTS AND GENERAL FINANCES: Prices and Sales of Listed American Shares, Dividends of American Mines, Dividends of Lake Superior Mines, Dividends and Assessments of Lake Mines, Capitalization of Lake Copper Companies—pages 1101 to 1110.

SUNDRY LOCAL STATISTICS: Forces Employed by Michigan and Montana Mines, Number of shareholders in Lake Copper Companies—page 1111.

FUTURE PRODUCTION OF COPPER: Sundry Tables based upon Production of the Nineteenth Century—pages 1112 to 1113.

WORLD'S COPPER PRODUCTION.

(Long Tons.)

Year.	United States.	Foreign.	Total	Percentage of U. S. Production.
1880.....	27,000	126,959	153,959	17
1881.....	32,000	131,000	163,000	19
1882.....	40,467	141,155	181,622	22
1883.....	51,574	147,832	199,406	24
1884.....	64,708	155,141	220,249	29
1885.....	74,052	151,540	225,592	32
1886.....	70,430	146,656	217,086	32
1887.....	81,017	142,781	223,798	36
1888.....	101,054	156,972	258,026	39
1889.....	101,239	159,966	261,205	38
1890.....	115,966	153,489	269,455	43
1891.....	126,839	152,552	279,391	45
1892.....	154,018	156,454	310,472	49
1893.....	147,033	156,497	303,530	48
1894.....	158,120	166,385	324,505	49
1895.....	169,917	164,648	334,565	50
1896.....	205,384	167,979	373,363	54
1897.....	220,571	178,384	398,955	54
1898.....	235,050	194,106	429,156	54
1899.....	253,870	215,440	469,310	54
1900.....	269,111	216,743	485,854	57
1901.....	268,522	242,497	511,019	53
1902.....	294,297	247,870	542,167	54
1903.....	311,582	273,499	585,081	54
1904.....	362,739	278,955	641,694	56

COPPER PRODUCTION BY CONTINENTS.

(1896-1904.)

(Long Tons.)

Year	North America.	Europe.	South America.	Asia.	Australasia.	Africa.	Totals.
1896.....	222,524	88,948	26,340	21,000	11,272	7,450	377,534
1897.....	242,679	90,829	25,300	23,000	16,583	7,440	405,831
1898.....	261,625	89,461	30,065	25,175	15,943	7,110	429,379
1899.....	282,636	93,383	32,730	27,560	20,894	6,490	463,693
1900.....	303,784	91,009	36,095	28,121	21,270	6,720	486,999
1901.....	320,044	91,161	43,080	27,475	28,633	7,472	517,865
1902.....	355,280	91,552	40,266	29,775	27,281	4,450	548,604
1903.....	384,138	94,056	42,561	31,360	28,116	5,230	585,461
1904.....	445,557	90,820	41,265	34,850	26,657	7,775	648,924

WORLD'S COPPER PRODUCTION BY COUNTRIES.

	(Long Tons.)						
	1890	1895	1900	1901	1902	1903	1904
Algeria.....	120	35	.....	.....	.....	.....	.....
Argentina.....	150	150	775	780	240	135	155
Australasia.....	7,500	10,000	23,000	30,875	28,640	29,468	34,160
Austria.....	1,210	1,110	865	1,015	1,015	1,055	1,275
Bolivia.....	1,900	2,250	2,100	2,000	2,000	2,000	2,000
Canada.....	3,050	4,000	8,500	18,800	17,485	19,321	19,185
Chile.....	26,120	22,075	25,700	30,000	28,930	30,930	30,110
Cape Colony.....	6,450	7,080	6,720	6,400	4,450	5,230	7,775
Great Britain.....	935	580	650	600	600	500	500
Germany.....	17,625	16,555	20,410	21,720	21,605	21,205	21,045
Hungary.....	300	200	490	320	485	330	175
Italy.....	2,200	2,500	2,955	3,000	3,370	3,100	3,335
Japan.....	15,000	18,430	27,840	27,475	29,775	31,360	34,850
Mexico.....	4,325	11,620	22,050	23,795	35,785	50,480	50,945
Newfoundland...	1,735	1,800	1,900	2,000	2,000	2,710	2,200
Norway.....	1,390	2,685	3,935	3,375	4,565	5,915	5,415
Perú.....	150	450	8,220	9,520	7,580	7,800	6,755
Russia.....	4,800	5,280	8,000	8,000	8,000	10,320	10,700
Sweden.....	830	515	450	450	455	455	390
Spain & Portugal	51,700	54,950	52,872	53,621	49,790	49,740	47,035
United States...	115,966	169,917	269,111	268,522	294,297	311,582	362,739
Turkey.....	.....	.....	520	980	1,100	1,400	950
Venezuela.....	5,640	.....	.....	.....	.....	.....	.....
Totals.....	269,096	332,182	486,363	513,243	542,167	585,081	641,694

ESTIMATE OF WORLD'S PRODUCTION FOR 1905.

The following table gives figures of actual production for 1903 and 1904, and a close approximation to the actual output for 1905:

	(Long Tons.)		
Country	1903	1904	1905
Argentina.....	135	155	150
Australasia.....	29,468	34,160	36,000
Austria.....	1,055	1,275	1,250
Bolivia.....	2,000	2,000	2,000
Canada.....	19,321	19,185	21,000
Chile.....	30,930	30,110	30,000
Cape Colony.....	5,230	7,775	7,500
Germany.....	21,205	21,045	22,000
Great Britain.....	500	500	500
Hungary.....	330	175	200
Italy.....	3,100	3,335	3,500
Japan.....	31,360	34,850	36,000
Mexico.....	50,480	50,945	65,000
Newfoundland.....	2,710	2,200	2,250
Norway.....	5,915	5,415	6,250
Perú.....	7,800	6,755	8,500
Russia.....	10,320	10,700	9,500
Sweden.....	455	390	500
Spain & Portugal....	49,740	47,035	46,000
United States.....	311,582	362,739	421,000
Turkey.....	1,400	950	1,000
Totals.....	585,081	641,694	721,900

For the calendar year 1906 the world's production of copper will fall but little short of 800,000 long tons.

WORLD'S PRODUCTION OF RAW COPPER.

(1895-1904.)

The following table, prepared by the Metallgesellschaft und Metallurgische Gesellschaft A.-G., includes in the figures of production for each country the copper estimated actually to have been produced from native and imported ores, from impure raw copper brought in for refining, and from imported refined raw copper:

(Metric Tons.)							
Country.	1895.	1899.	1900.	1901.	1902.	1903.	1904.
United States....	170,100	270,100	277,000	281,600	341,100	362,800	422,675
Great Britain.....	78,246	79,100	80,000	80,000	66,500	70,300	65,500
Germany.....	25,777	34,634	30,929	31,376	30,591	31,214	30,262
France.....	8,245	6,600	6,400	6,500	7,300	7,100	7,000
Austria-Hungary..	1,276	1,479	1,200	1,350	1,350	1,400	1,463
Italy.....	2,375	3,032	2,797	3,000	3,500	3,900	3,700
Russia.....	5,854	7,533	8,100	8,100	8,800	10,500	10,900
Sweden, Norway, etc.	1,500	2,300	2,500	3,200	9,900	12,200	11,500
Chile.....	19,600	17,100	19,800	23,400	22,300	20,000	22,000
Japan.....	11,500	21,000	19,300	20,900	14,400	16,300	3,850
Australia.....	8,100	16,800	17,400	19,900	18,400	16,000	12,200
Japan & Australia Asiatic consumption.....	8,000	9,000	10,100	8,000	15,500	15,500	38,000
Mexico, Canada, etc.....	10,900	9,300	9,300	12,200	10,000	13,000	10,000
Totals.....	351,473	477,978	484,826	499,526	532,700	580,214	639,050

WORLD'S PRODUCTION FOR THE NINETEENTH CENTURY.

(Long Tons.)

DECADE.	Average Price of Rough Copper.	World's Production of Each Decade.	Increase of Production over Previous Decades.	Average Annual Production for Each Decade.	Increase of Average Annual Production.
1801 to 1810	£160	91,000	.....	9,100	.....
1811 to 1820	130	96,000	5,000	9,600	500
1821 to 1830	101	135,000	39,000	13,500	3,900
1831 to 1840	94	218,400	83,400	21,840	8,340
1841 to 1850	83	291,000	72,600	29,100	7,260
1851 to 1860	111	506,999	215,999	50,699	21,599
1861 to 1870	87	900,000	393,001	90,000	39,300
1871 to 1880	79	1,189,000	289,000	118,900	28,900
1881 to 1890	60	2,373,398	1,084,398	237,339	108,439
1891 to 1900	52	3,708,901	1,335,503	370,890	133,550
Totals and Averages	96	9,507,299	.....	95,073	.....

PRODUCTION OF WORLD'S LARGEST MINES.

(Pounds Avotrdupois.)

Year.	Calumet & Hecla.	Anaconda.	Rio Tinto.	Boston & Montana.	Mansfeld.	Copper Queen.
1867..	1,315,173		1,937,843		5,865,898	
1868..	5,098,375		2,475,765		7,442,226	
1869..	12,315,771		2,147,280		8,084,140	
1870..	14,031,584		2,231,055		8,384,980	
1871..	16,222,590		1,895,956		8,718,480	
1872..	16,162,183		1,772,498		12,070,542	
1873..	18,848,265				12,281,487	
1874..	20,125,225				11,372,905	
1875..	21,473,954				13,312,499	
1876..	21,690,732		11,731,708		13,852,024	
1877..	23,568,468		41,057,139		15,230,287	
1878..	25,253,128		54,245,564		17,645,115	
1879..	26,270,943		50,228,595		18,882,434	
1880..	31,675,239		58,775,915		21,734,902	1,379,940
1881..	31,360,781		61,171,913		24,377,210	3,866,581
1882..	32,053,528		38,951,360		25,795,840	7,744,278
1883..	33,125,045		45,857,280		28,310,320	7,523,961
1884..	40,473,585		48,303,360		28,183,680	7,668,617
1885..	47,247,990		52,604,160		27,888,000	6,663,782
1886..	50,518,220		55,328,000		28,212,800	3,797,256
1887..	46,016,123		63,840,000		29,176,000	5,707,728
1888..	50,295,721		63,840,000		29,970,200	12,031,614
1889..	48,668,296		66,080,000		34,733,440	12,152,910
1890..	59,868,106		67,200,000		35,392,000	13,120,934
1891..	63,586,620		71,680,000		30,920,000	13,022,957
1892..	56,495,211		70,560,000		34,406,400	12,916,416
1893..	60,427,913		69,664,000		31,896,000	13,795,618
1894..	61,324,626	95,578,000	73,920,000	50,000,000	33,677,600	12,968,372
1895..	79,137,399	99,775,294	75,040,000	55,000,000	33,286,400	16,235,723
1896..	89,280,621	125,350,693	73,920,000	60,250,000	40,913,600	22,966,169
1897..	83,248,054	131,471,127	75,936,000	60,000,000	40,230,400	23,999,873
1898..	86,426,320	107,214,059	75,499,200	62,000,000	40,420,800	33,747,390
1899..	89,610,963	107,914,357	76,988,800	65,000,000	46,558,400	36,901,684
1900..	77,761,382	110,000,000	80,039,680	66,200,000	41,193,600	34,382,309
1901..	82,519,676	101,850,224	79,179,520	70,000,000	41,067,200	39,781,333
1902..	81,248,739	100,000,000	77,235,200	75,000,000	41,000,000	35,831,735
1903..	76,490,869	93,500,000	80,214,400	90,750,000	42,500,278	36,385,000
1904..	80,341,019	90,000,000	80,214,400	94,000,000	41,629,349	58,605,000
1905..	95,100,610	95,000,000	72,307,200	89,000,000	43,824,141	64,570,847

PRODUCTION OF WORLD'S LEADING MINES.

In the following table are given annual products, for latest years available, of all really important copper mines of the world, and also of a great majority of the smaller mines making as much as 50 short tons fine copper yearly. The products given in round numbers are estimates, based upon the best information available, the other figures being exact returns.

(Pounds Avoirdupois.)

No.	Mine or Company.	Location.	Year.	Output.
1	Calumet & Hecla.....	Michigan, U. S. A....	1905	95,100,610
2	Anaconda.....	Montana, U. S. A....	"	95,000,000
3	Boston & Montana.....	Montana, U. S. A....	"	89,000,000
4	American Smeltg. & Refg. Co.....	U. S. A. & Mexico.	"	72,952,000
5	Rio Tinto.....	Spain.....	"	72,307,200
6	Copper Queen.....	Arizona, U. S. A....	"	64,570,847
7	Greene Consolidated.....	Mexico.....	"	64,211,895
8	Mansfeld.....	Germany.....	"	43,824,141
9	United Verde.....	Arizona, U. S. A....	"	33,000,000
10	Copper Range.....	Michigan, U. S. A....	"	32,714,859
11	Calumet & Arizona.....	Arizona, U. S. A....	"	31,772,896
12	North Butte.....	Montana, U. S. A....	"	30,954,788
13	United Copper Co.....	"	"	27,081,350
14	Arizona Copper Co.....	Arizona, U. S. A....	"	26,836,000
15	Furukawa.....	Japan.....	"	23,780,573
16	Boleo.....	Mexico.....	"	22,817,610
17	Osceola.....	Michigan, U. S. A....	"	18,938,965
18	Quincy.....	"	"	18,827,557
19	Mt. Lyell.....	Tasmania.....	"	18,592,000
20	Original.....	Montana, U. S. A....	"	18,000,000
21	Granby.....	British Columbia...	"	17,843,390
22	Utah Consolidated.....	Utah, U. S. A....	"	17,264,474
23	Cape Copper Co.....	Cape Colony & Nfld.	"	16,358,720
24	United States Mng. Co....	Utah, U. S. A....	"	15,841,667
25	Tamarack.....	Michigan, U. S. A....	"	15,824,008
26	Champion.....	Michigan, U. S. A....	"	15,707,426
27	Old Dominion.....	Arizona, U. S. A....	1904	15,368,147
28	Detroit.....	"	1905	14,692,421
29	Ashio.....	Japan.....	1904	14,622,500
30	Bingham Cons.....	Utah, U. S. A....	1905	14,396,269
31	Baltic.....	Michigan, U. S. A....	"	14,384,684
32	Fujita-Kumi & Co.....	Japan.....	"	13,984,768
33	Sumitomo.....	"	"	13,225,000
34	Mitsu Bishi.....	"	"	12,727,944
35	Tharsis.....	Spain.....	"	12,590,226
36	Trenton.....	Montana, U. S. A....	"	12,500,000
37	Wallerroo & Moonta.....	Australia.....	1904	12,250,000
38	Butte & Boston.....	Montana, U. S. A....	1905	12,000,000
39	Shannon.....	Arizona, U. S. A....	"	11,027,453
40	Great Cobar.....	Australia.....	"	11,000,000
41	Moctezuma.....	Mexico.....	"	10,800,000
42	Trimountain.....	Michigan, U. S. A....	"	10,476,462
43	Mountain.....	California, U. S. A....	"	10,000,000
44	Kosaka.....	Japan.....	"	9,500,000

PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

		(Pounds Avoirdupois.)			
No.	Mine or Company.	Location.	Year.	Output.	
45	Wolverine.....	Michigan, U. S. A...	1605	9,464,418	
46	Mohawk.....	" "	"	9,387,614	
47	Lota i Coronel.....	Chile.....	1904	9,000,000	
48	Parrot.....	Montana, U. S. A...	1905	9,000,000	
49	Washoe.....	" "	"	8,000,000	
50	Tennessee.....	Tennessee, U. S. A...	"	7,977,982	
51	St. Mary's M. L. Co.....	Michigan, U. S. A...	"	7,912,004	
52	Teziutlán.....	Mexico.....	"	7,512,252	
53	United Globe.....	Arizona, U. S. A...	"	7,000,000	
54	Ducktown.....	Tennessee, U. S. A...	"	6,547,212	
55	Mazapil.....	Mexico.....	"	6,496,000	
56	Sulitelma.....	Norway.....	"	6,225,856	
57	O'okiep.....	Cape Colony.....	"	6,117,440	
58	Mason & Barry.....	Spain.....	"	6,088,320	
59	Guggenheim Expln. Co...	Mexico.....	"	6,000,000	
60	Montecatini.....	Italy.....	"	5,892,895	
61	Imperial.....	Arizona, U. S. A.....	"	5,687,152	
62	Newhouse.....	Utah, U. S. A.....	"	5,670,993	
63	British Columbia.....	British Columbia.....	"	5,601,309	
64	Arghana Maden.....	Turkey.....	1904	5,500,000	
65	Utah Copper Co.....	Utah, U. S. A.....	1905	5,473,469	
66	Namaqualand.....	Cape Colony.....	"	5,276,712	
67	Nababeep.....	"	"	5,136,320	
68	Tilt Cove.....	Newfoundland.....	"	5,104,960	
69	Bully Hill.....	California, U. S. A...	"	5,000,000	
70	Descubridora.....	Mexico.....	1903	4,964,272	
71	Snow Storm.....	Idaho, U. S. A.....	1905	4,950,000	
72	San Juan.....	Chile.....	"	4,750,000	
73	Katarski.....	Russia.....	1904	4,750,000	
74	Central Chili.....	Chile.....	1905	4,596,480	
75	Canadian Smeltg. Wks....	British Columbia.....	"	4,571,764	
76	Catemou.....	Chile.....	"	4,401,270	
77	Canadian Copper Co.....	Ontario.....	"	4,326,000	
78	Atacama.....	Chile.....	1903	4,250,170	
79	Mt. Garnet.....	Australia.....	1901	4,220,016	
80	Franklin.....	Michigan, U. S. A...	1905	4,206,085	
81	Tintic.....	Utah, U. S. A.....	"	4,069,886	
82	Atlantic.....	Michigan, U. S. A.....	"	4,049,731	
83	Dolores y Anexas.....	Mexico.....	1904	4,015,000	
84	Mammoth.....	California, U. S. A...	1905	4,000,000	
85	Carrizal.....	Chile.....	1903	3,750,000	
86	Democrata.....	Mexico.....	"	3,747,820	
87	Las Animas.....	Chile.....	"	3,701,976	
88	Pacific Smeltg. Co.....	"	1905	3,700,000	
89	Rammelsberg.....	Germany.....	"	3,527,360	
90	Jimulco.....	Mexico.....	"	3,413,735	
91	Maipú.....	Chile.....	1904	3,250,000	
92	Boston Consolidated.....	Utah, U. S. A.....	"	3,223,836	
93	Rudianski.....	Russia.....	1899	3,122,112	
94	Tyee.....	British Columbia.....	1905	3,039,398	
95	Chilena de Fundiciones...	Chile.....	1903	3,000,000	
96	Mitchell.....	Mexico.....	1905	3,000,000	
97	Ohio.....	Utah, U. S. A.....	"	3,000,000	

PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(Pounds Avoirdupois.)				
No.	Mine or Company.	Location.	Year.	Output.
98	Isle Royale.....	Michigan, U. S. A....	1905	2,973,761
99	Kedabeg.....	Russia.....	1904	2,966,720
100	Queensland.....	Australia.....	1905	2,952,320
101	Michigan.....	Michigan, U. S. A....	"	2,891,796
102	Tinto & Santa Rosa.....	Spain.....	1902	2,878,400
103	Santiago Vicuña.....	Chile.....	1903	2,875,000
104	Seville.....	Spain.....	1905	2,867,200
105	Ramos.....	Mexico.....	"	2,750,000
106	Bogoslovsk.....	Russia.....	1903	2,749,789
107	Copiapó.....	Chile.....	1905	2,515,520
108	Artola Hnos.....	"	"	2,500,000
109	Besa y Ca.....	"	"	2,500,000
110	Spassky.....	Siberia.....	"	2,500,000
111	Osaruzawa.....	Japan.....	1902	2,448,000
112	Penn-Wyoming.....	Wyoming, U. S. A....	1905	2,385,629
113	Coro Coro.....	Bolivia.....	1904	2,375,000
114	Tiro General.....	Mexico.....	1905	2,281,761
115	Chillagoe.....	Australia.....	"	2,266,880
116	Ani.....	Japan.....	1904	2,264,000
117	Le Roi.....	British Columbia....	"	2,250,000
118	Girilambone.....	Australia.....	"	2,225,000
119	Britannia.....	British Columbia....	1905	2,200,000
120	Sado.....	Japan.....	1903	2,150,000
121	"Lloyd".....	Australia.....	1905	2,058,560
122	Noel Berthin.....	Bolivia.....	1903	2,028,232
123	Mass.....	Michigan, U. S. A....	1905	2,007,950
124	Paramatta.....	Australia.....	1904	2,000,000
125	Santa Ines y Morococha..	Perú.....	1905	2,000,000
126	Alverdski.....	Russia.....	1903	2,000,000
127	Santa Rita.....	New Mexico, U. S. A..	1905	2,000,000
128	Cervero.....	Chile.....	1902	1,792,000
129	Hibira.....	Japan.....	1900	1,769,498
130	San Miguel.....	Spain.....	1905	1,712,800
131	Arakawa.....	Japan.....	1900	1,734,522
132	Peña.....	Spain.....	1905	1,724,800
133	Lake Superior & Pittsburg	Arizona, U. S. A....	"	1,721,295
134	Kusakura.....	Japan.....	1904	1,650,000
135	Mt. Lyell Blocks.....	Tasmania.....	1905	1,650,000
136	Röros.....	Norway.....	1904	1,641,920
137	Stadtberger.....	Germany.....	1905	1,609,358
138	Adventure.....	Michigan, U. S. A....	"	1,606,208
139	Ahmeek.....	"	"	1,552,957
140	Castillo del Buitron.....	Spain.....	"	1,500,000
141	Panuco.....	Mexico.....	1902	1,466,059
142	Centennial.....	Michigan, U. S. A....	1905	1,446,584
143	War Eagle.....	British Columbia....	"	1,400,000
144	Felix Vicuña.....	Chile.....	1903	1,400,000
145	Indian Queen.....	Montana, U. S. A....	"	1,400,000
146	Galizurski.....	Russia.....	1899	1,390,095
147	Bede.....	Spain & Norway....	1905	1,370,880
148	Kune.....	Japan.....	1904	1,356,300
149	Takilma.....	Washington, U. S. A..	1905	1,350,000
150	Obie.....	Japan.....	1899	1,316,745
151	Carmen.....	Chile.....	1905	1,300,000

PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(Pounds Avoirdupois.)

No.	Mine or Company.	Location.	Year.	Output.
152	Gulf Creek.....	Australia.....	1901	1,254,400
153	Mitterberg.....	Austria.....	1905	1,254,400
154	Lake George.....	Australia.....	1901	1,250,000
155	P. Gonzalez.....	Chile.....	1904	1,250,000
156	Aguascalientes.....	Mexico.....	1905	1,250,000
157	White Knob.....	Idaho, U. S. A.....	1904	1,250,000
158	Daly West.....	Utah, U. S. A.....	1905	1,225,731
159	Makimine.....	Japan.....	1900	1,208,282
160	Marble Bay.....	British Columbia....	1905	1,200,000
161	Orito.....	Chile.....	1904	1,200,000
162	Bufo.....	Mexico.....	"	1,200,000
163	Mogollon.....	New Mexico U. S. A.....	"	1,200,000
164	Sucesion C. J. Lambert...	Chile.....	1903	1,175,000
165	Alloues.....	Michigan, U. S. A....	1905	1,167,957
166	Sucesion Ramón F. Ovalle	Chile.....	1902	1,150,000
167	Centre Star.....	British Columbia....	1904	1,121,644
168	Snow Shoe.....	" "	"	1,100,000
169	Capanne Vecchie e Poggio Bindo.....	Italy.....	1902	1,100,000
170	Standard.....	Arizona, U. S. A....	1905	1,088,952
171	Yoshioka.....	Japan.....	1900	1,081,346
172	Itsuki.....	"	"	1,080,163
173	J. K. Child & Co.....	Bolivia.....	1904	1,075,200
174	Ogoya.....	Japan.....	1899	1,015,759
175	Crowl Creek.....	Australia.....	1905	1,000,000
176	Graslitz.....	Austria.....	1901	1,000,000
177	Huanchaca de Bolivia....	Bolivia.....	1903	1,000,000
178	Maitenes.....	Chile.....	1901	1,000,000
179	Etruscan.....	Italy.....	1904	1,000,000
180	Cabezas del Pasto.....	Spain.....	"	1,000,000
181	Sotiel Coronada.....	"	"	1,000,000
182	North Mt. Lyell.....	Tasmania.....	1905	1,000,000
183	Gibson.....	Arizona, U. S. A....	"	1,000,000
184	Ikuno.....	Japan.....	1900	984,355
185	Guillermo Cavallo.....	Chile.....	1903	950,000
186	Iron Silver.....	Colorado, U. S. A....	1904	948,902
187	Blayney.....	Australia.....	1901	936,320
188	Mond.....	Ontario.....	1901	917,600
189	Le Roi No. 2.....	British Columbia....	1905	885,992
190	Puquios.....	Chile.....	1903	875,000
191	Cia. Met. de Torreón....	Mexico.....	"	874,346
192	Las Herreras.....	Spain.....	1905	857,920
193	Aljustrel.....	Portugal.....	1903	850,000
194	Niblack.....	Alaska, U. S. A....	1905	850,000
195	Union.....	N'th Carolina, U.S.A.	"	850,000
196	Komaki.....	Japan.....	1904	800,000
197	Equator.....	Arizona, U. S. A....	1905	800,000
198	Pittsburg & Montana....	Montana, U. S. A....	"	790,000
199	Northern Territories....	Australia.....	"	750,000
200	Kupferplatte.....	Austria.....	1901	750,000
201	Pitkaranta.....	Finland.....	1902	750,000
202	Horn Silver.....	Utah, U. S. A....	"	717,353
203	Altens.....	Norway.....	1904	705,472
204	Hadley.....	Alaska, U. S. A....	1905	698,486

PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(Pounds Avoirdupois.)

No.	Mine or Company.	Location.	Year.	Output.
205	Majestic.....	Utah, U. S. A.....	1903	693,600
206	Kargalinski.....	Russia.....	1899	680,674
207	Broken Hill.....	Australia.....	1901	675,000
208	Española de Fundicion...	Chile.....	1904	650,000
209	Winona.....	Michigan, U. S. A....	"	646,025
210	Stora Kopparberg.....	Sweden.....	"	625,000
211	Nagamatsu.....	Japan.....	"	620,000
212	Omodani.....	".....	1900	614,438
213	Copper Belle.....	Arizona, U. S. A.....	1905	600,000
214	Copper King.....	California, U. S. A...	"	600,000
215	Live Oak.....	Arizona, U. S. A.....	"	587,961
216	Carreras Hnos.....	Bolivia.....	1904	575,000
217	Hisanichi.....	Japan.....	1900	566,268
218	Libiola.....	Italy.....	1903	564,292
219	Fernando.....	Mexico.....	"	554,609
220	Dogamaru.....	Japan.....	1900	551,164
221	Furokura.....	".....	1904	550,000
222	Atvidaberg.....	Sweden.....	"	550,000
223	Denoro.....	British Columbia....	"	529,930
224	Yaeger Cañon.....	Arizona, U. S. A....	"	520,000
225	Killingdal.....	Norway.....	1905	512,960
226	Caucasus.....	Russia.....	1905	511,920
227	Hamley.....	Australia.....	1904	500,000
228	El Cobre.....	Cuba.....	1903	500,000
229	Ligure Ramifera.....	Italy.....	"	500,000
230	Tzarevo Alexandrovski...	Siberia.....	1904	500,000
231	Brixlegg.....	Austria.....	1902	485,012
232	F. de P. Perez.....	Chile.....	1904	450,000
233	San Luis.....	Mexico.....	1905	450,000
234	Saddle Mountain.....	Arizona, U. S. A.....	"	445,000
235	Hampden.....	Australia.....	1901	431,692
236	Funatsu.....	Japan.....	1904	425,000
237	Spence.....	California, U. S. A...	1902	425,000
238	Utah & Eastern.....	Utah, U. S. A.....	1905	400,166
239	Mount Molloy.....	Australia.....	1902	400,000
240	Carias.....	Utah, U. S. A.....	1905	400,000
241	Naverfjord.....	Norway.....	1902	396,828
242	Pittsburg & Duluth.....	Arizona, U. S. A.....	1905	390,179
243	Ajax.....	Utah, U. S. A.....	"	380,675
244	Nafverberg.....	Sweden.....	1901	375,000
245	Latouche.....	Alaska, U. S. A.....	1905	375,000
246	Santa Fé.....	Mexico.....	1903	370,483
247	Geisse Hnos.....	Chile.....	"	360,000
248	Otto Harnecker.....	".....	"	350,000
249	Canyon Copper Co.....	Arizona, U. S. A.....	1904	350,000
250	Kokusei.....	Japan.....	1899	348,497
251	Tasmanian.....	Australia.....	1904	337,075
252	Cobar Chesney.....	".....	"	325,000
253	Hall.....	British Columbia....	"	318,124
254	Las Vigas.....	Mexico.....	1903	300,000
255	Mizusawa.....	Japan.....	1904	296,000
256	New Mt. Mope.....	Australia.....	1903	275,000
257	Esperanza.....	Mexico.....	1905	275,000
258	Sasagatini.....	Japan.....	1900	274,412

PRODUCTION OF WORLD'S LEADING MINES. (Continued.)

(Pounds Avoirdupois)

No.	Mine or Company.	Location.	Year.	Output.
259	Phoenix.....	Michigan, U. S. A....	1905	273,219
260	American-Mexico.....	Mexico.....	1904	261,531
261	Mt. Morgan.....	Australia.....	1905	257,600
262	Burra Burra.....	".....	1904	250,000
263	Bossmo.....	Norway.....	1902	250,000
264	Rambler.....	Wyoming, U. S. A. .	1903	249,196
265	Omaki.....	Japan.....	1902	245,000
266	Wissener.....	Germany.....	"	240,742
267	Einaleigh Freehold.....	Australia.....	1901	232,960
268	Clemente Ham.....	Mexico.....	1902	231,830
269	Ate.....	Japan.....	1900	231,484
270	Quilomenco.....	Chile.....	1901	225,000
271	Francisco Vergara I.....	".....	"	225,000
272	Mendoza y Ca.....	Mexico.....	1903	218,874
273	Monterey S. & R. Co.....	".....	"	215,568
274	Kafveltorps.....	Sweden.....	1901	214,919
275	Eclipse-Argo.....	Montana.....	1903	204,570
276	Mungana.....	Australia.....	1905	201,600
277	Cucharas.....	Mexico.....	1903	200,618
278	Lower Mammoth.....	Utah, U. S. A.....	"	200,000
279	Otori.....	Japan.....	1904	187,000
280	Tsuboi.....	".....	1900	183,876
281	Nishinokawa.....	".....	"	183,415
282	Coahuila.....	Mexico.....	1903	178,865
283	Capillitas.....	Argentina.....	1905	176,960
284	Boberthaler.....	Germany.....	1902	176,368
285	J. M. Echevarria.....	Chile.....	1904	175,000
286	Maximilian.....	Germany.....	"	175,000
287	Oregon S. & R. Co.....	Oregon, U. S. A.....	1905	174,458
288	Meriski.....	Russia.....	1899	164,092
289	Shamblürski.....	".....	"	162,142
290	Castellanos y Ca.....	Chile.....	1904	160,000
291	Lake Superior & Arizona .	Arizona, U. S. A.....	1905	155,000
292	Kurotaki.....	Japan.....	1900	151,890
293	Hogasho.....	".....	"	138,032
294	Sawatari.....	".....	"	137,191
295	Eureka Hill.....	Utah, U. S. A.....	1904	134,000
296	Pike Hill.....	Vermont, U. S. A....	1905	131,911
297	Papovski.....	Siberia.....	1899	129,497
298	San Carlos.....	Mexico.....	1903	125,000
299	Los Ocotes.....	".....	1904	121,000
300	Hisamune.....	Japan.....	1899	112,196
301	Turgovski.....	Russia.....	1900	111,686
302	Maze.....	Japan.....	"	110,582
303	Irigoyen Hnos. y Ca.....	Mexico.....	1902	107,804
304	Higashiyama.....	Japan.....	1898	104,424
305	Hecla.....	Montana, U. S. A....	1901	103,671
306	Dingo.....	Australia.....	1901	100,000
307	Silver Spur.....	".....	1905	100,000
308	José R. Espinoza.....	Chile.....	1902	100,000
309	Sucesion Francisco Geisse.	".....	1903	100,000
310	Omori.....	Japan.....	"	100,000
311	Yamate.....	".....	"	100,000
312	La Dura.....	Mexico.....	"	100,000
313	Quintera.....	".....	1902	100,000

AMERICAN COPPER PRODUCTION.

(Long Tons.)

Year.	United States Total Production	Michigan— Production Per cent of total	Montana— Production Per cent of total	Arizona— Production Per cent of total
1850.....	650	572	88	.....
1851.....	900	779	86	.....
1852.....	1,100	792	72	.....
1853.....	2,000	1,297	65	.....
1854.....	2,250	1,819	81	.....
1855.....	3,000	2,593	86	.....
1856.....	4,000	3,666	91	.....
1857.....	4,800	4,255	88	.....
1858.....	5,500	4,088	74	.....
1859.....	6,300	3,985	63	.....
1860.....	7,200	5,388	74	.....
1861.....	7,500	6,713	89	.....
1862.....	9,000	6,065	67	.....
1863.....	8,500	5,797	68	.....
1864.....	8,000	5,576	69	.....
1865.....	8,500	6,410	75	.....
1866.....	8,900	6,138	69	.....
1867.....	10,000	7,824	78	.....
1868.....	11,600	9,346	80	.....
1869.....	12,500	11,886	95	.....
1870.....	12,600	10,992	87	.....
1871.....	13,000	11,942	91	.....
1872.....	12,500	10,961	87	.....
1873.....	15,500	13,433	86	.....
1874.....	17,500	15,327	87	.....
1875.....	18,000	16,089	89	.....
1876.....	19,000	17,085	89	.....
1877.....	21,000	17,422	83	.....
1878.....	21,500	17,719	82	.....
1879.....	23,000	19,129	83	.....
1880.....	27,000	22,204	82	.....
1881.....	32,000	24,363	76	.....
1882.....	40,467	25,439	62	.....
1883.....	51,574	26,653	51	11,011
1884.....	64,708	30,961	47	19,256
1885.....	74,052	32,209	43	30,267
1886.....	70,430	36,124	51	25,362
1887.....	81,017	33,941	42	35,133
1888.....	101,054	38,604	38	43,704
1889.....	101,239	39,364	38	43,849
1890.....	115,966	45,273	39	50,437
1891.....	126,839	50,992	40	50,028
1892.....	154,018	54,999	36	72,860
1893.....	147,033	50,270	34	69,290
1894.....	158,120	51,031	32	81,729
1895.....	169,917	57,737	34	84,900
1896.....	205,384	63,418	31	99,071
1897.....	220,571	63,706	29	102,807
1898.....	235,050	66,056	28	92,041
1899.....	253,870	65,603	26	100,503
1900.....	269,111	63,461	24	120,865
1901.....	268,522	69,501	26	102,620
1902.....	294,297	76,050	26	128,975
1903.....	311,582	85,848	27	121,677
1904.....	362,739	93,001	26	133,176

UNITED STATES COPPER PRODUCTION BY STATES.

1901-1904.				
(Pounds Avoirdupois.)				
State.	1901.	1902.	1903.	1904.
Montana.....	229,870,415	288,903,820	272,555,854	298,314,804
Michigan.....	155,604,145	170,325,598	192,299,191	208,329,248
Arizona.....	130,778,611	119,944,944	147,648,271	191,602,958
Utah.....	20,116,979	23,939,901	38,302,602	47,062,889
California.....	33,667,456	25,038,724	17,776,756	28,529,023
Colorado.....	9,801,783	8,422,030	4,158,368	9,506,944
East and South...	6,860,039	13,599,047	13,855,612	15,211,086
New Mexico.....	9,629,884	6,614,961	7,300,832	5,368,666
Wyoming.....	2,698,712	889,228	1,023,189	3,565,629
South Dakota....	753,510	445,663	173,202	100,000
Nevada.....	593,608	164,301	150,000	.....
Idaho.....	480,511	227,500	778,908	2,158,858
Alaska.....	.....	.....	1,339,590	2,043,586
Washington.....	.....	209,297	80,758	663,694
Miscellaneous....	531,530	500,000	500,000	120,118
Total domestic.	601,499,886	659,225,014	697,943,131	812,537,267
From imported ores and matte.	64,000,000	40,000,000	32,000,000	38,947,772
Gross Production.	665,499,886	699,225,014	729,943,131	851,485,039

LAKE SUPERIOR COPPER PRODUCTION BY MINES.

1902-1905.				
(Pounds Avoirdupois.)				
Mines.	1902.	1903.	1904.	1905.
Calumet & Hecla...	81,248,739	76,490,869	80,341,019	95,100,610
Osceola.....	13,416,396	16,059,636	20,472,429	18,938,965
Quincy.....	18,988,491	18,498,288	18,343,160	18,827,557
Tamarack.....	15,961,528	15,286,093	14,961,885	15,824,008
Champion.....	4,165,784	10,564,147	12,212,954	15,707,426
Baltic.....	6,285,819	10,580,997	12,177,729	14,384,684
Trimountain.....	5,732,160	9,237,051	10,211,230	10,476,462
Wolverine.....	6,473,181	9,024,034	9,764,455	9,464,418
Mohawk.....	226,824	6,284,327	8,149,515	9,387,614
Atlantic.....	4,949,366	5,505,598	5,321,859	4,049,731
Franklin.....	5,237,460	5,309,030	4,771,050	4,206,085
Isle Royale.....	3,569,748	3,134,601	2,442,905	2,973,761
Michigan.....	166,898	275,708	2,746,127	2,891,796
Mass.....	2,345,805	2,576,447	2,182,931	2,007,950
Adventure.....	606,211	2,182,608	1,380,480	1,606,208
Ahmeek.....	.....	.....	* 350,000	1,552,957
Centennial.....	.....	.....	641,294	1,446,584
Phoenix.....	.....	202,823	1,162,201	273,219
Winona.....	101,188	1,036,944	646,025	.....
Arcadian.....	* 600,000	.....	.....	.....
Miscellaneous....	* 250,000	* 50,000	* 50,000	* 150,000
Totals.....	170,325,598	192,299,191	208,329,248	229,270,085

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.

Year.	Gross Product fine copper (Pounds).	Gross value of production (Dollars).	Total Dividends paid (Dollars).	Percentage of dividends to gross values.	Dividends per pound of copper (Cents).
1845....	24,880	5,000	.....	.....	.....
1846....	58,240	10,000	.....	.....	.....
1847....	297,120	55,000	.....	.....	.....
1848....	1,032,640	200,900	.....	.....	.....
1849....	1,505,280	336,000	60,000	17.0	3.98
1850....	1,281,280	286,000	84,000	29.0	6.55
1851....	1,744,960	289,500	60,000	12.0	3.43
1852....	1,774,080	396,000	60,000	15.0	3.38
1853....	2,905,280	648,500	90,000	14.0	3.09
1854....	4,074,560	909,500	198,000	21.0	4.85
1855....	5,809,334	1,586,160	168,000	10.0	2.89
1856....	8,217,392	2,218,320	380,000	17.0	4.62
1857....	9,530,830	2,382,500	480,000	20.0	5.03
1858....	9,159,916	2,129,235	460,000	21.0	5.00
1859....	8,937,995	1,950,355	360,000	18.0	4.02
1860....	12,068,375	2,654,960	120,000	5.0	0.99
1861....	15,182,837	3,487,995	260,000	7.0	1.70
1862....	13,586,318	3,634,255	440,000	12.0	3.23
1863....	12,985,444	4,415,600	720,000	16.0	5.54
1864....	12,491,965	5,870,300	1,150,000	19.0	9.20
1865....	14,358,592	5,635,515	510,000	9.0	3.55
1866....	13,750,063	4,629,375	170,000	3.7	1.23
1867....	17,515,607	4,442,841	110,000	2.4	0.63
1868....	20,934,124	4,940,424	100,000	2.0	0.47
1869....	26,625,301	6,230,016	210,000	3.4	0.78
1870....	24,622,759	5,096,752	700,000	13.0	2.84
1871....	25,746,448	5,728,485	1,640,000	29.0	6.36
1872....	24,553,523	7,979,400	3,080,000	38.0	11.54
1873....	30,291,505	8,726,100	2,330,000	27.0	7.69
1874....	34,334,389	8,009,356	1,940,000	24.0	5.06
1875....	36,039,497	8,180,625	1,920,000	23.0	5.32
1876....	38,270,997	7,998,430	1,870,000	23.0	4.88
1877....	39,026,671	7,327,880	1,840,000	25.0	4.71
1878....	41,687,266	6,920,540	1,860,000	27.0	4.46
1879....	42,671,529	7,327,350	1,818,620	25.0	4.26
1880....	49,718,337	9,947,673	3,080,000	30.9	6.19
1881....	54,548,909	9,971,702	2,665,000	26.7	4.88
1882....	57,155,980	10,522,416	2,850,000	27.1	4.99
1883....	59,702,404	9,457,853	2,670,000	28.1	4.47
1884....	69,353,202	9,494,306	1,327,500	12.9	1.91
1885....	72,147,889	7,942,597	1,970,000	24.8	2.73
1886....	80,918,460	8,788,476	1,900,000	21.5	2.34
1887....	76,028,697	8,530,342	1,370,000	16.1	1.80
1888....	86,472,034	14,510,001	3,260,000	22.4	3.77
1889....	88,175,675	11,894,942	2,670,000	22.4	3.03
1890....	101,410,277	15,819,960	3,415,000	21.6	3.36
1891....	114,222,709	14,574,727	3,540,000	24.3	3.10
1892....	123,198,460	12,431,624	3,260,000	26.2	2.64
1893....	112,605,078	12,106,145	3,520,000	29.1	3.12
1894....	114,308,870	10,852,122	2,380,000	21.9	2.08
1895....	129,330,749	13,877,109	3,280,000	23.6	2.54
1896....	142,057,500	15,758,935	3,985,000	25.3	2.80
1897....	142,702,586	16,530,843	5,431,000	32.8	3.80

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.—Cont'd.					
Year.	Gross Product fine copper (Pounds.)	Gross value of production (Dollars.)	Total Dividends paid (Dollars.)	Percentage of dividends to gross values.	Dividends per pound of copper (Cents.)
1898....	147,965,738	17,829,871	6,857,250	38.4	4.63
1899....	146,950,338	26,098,382	12,318,450	47.2	8.39
1900....	142,151,571	23,691,928	9,811,200	41.3	6.90
1901....	155,716,848	26,038,857	7,496,900	28.8	4.81
1902....	170,325,598	20,711,592	3,440,000	16.6	2.02
1903....	192,299,191	26,383,449	4,980,000	18.8	2.59
1904....	205,488,229	26,713,469	5,432,300	20.3	2.64
1905....	229,270,035	36,431,008	9,224,600	25.3	4.02
Totals..	4,006,629,768	\$549,337,607	\$137,322,820	25.0	3.42

AMERICAN IMPORTS OF COPPER.

(1890-1904.)

The following table showing imports of copper into the United States, in various forms, is summarized from the official figures of the United States government. The figures are somewhat unsatisfactory, for the reason that after and including 1895 the figures of ore are for gross weight of imported ore, while for preceding years the figures are for copper contents of the ore.

(Pounds Avoirdupois.)

Year.	Ore.	Matte.	Raw Copper.	Old Copper.	Estimated Total Fine Copper.
1890...	3,448,237	221,838	5,189	284,789	3,960,053
1891...	8,931,554	2,403,919	2,556	134,407	11,472,436
1892...	7,669,978	303,087	22,097	71,485	8,066,647
1893...	7,256,015	3,175,559	554,348	59,375	11,045,297
1894...	4,804,614	5,873,820	606,415	160,592	11,445,441
1895...	a8,921,920	a3,104,640	7,979,322	1,336,901	.....
1896...	a2,620,800	a3,427,200	9,074,379	2,422,554	.....
1897...	a43,919,680	2,974,720	12,646,552	1,780,390	28,923,098
1898...	a107,253,440	1,583,680	5,892,944	1,986,133	73,916,467
1899...	a120,934,616	7,763,885	64,282,583	6,678,145	95,722,340
1900...	a109,123,840	27,534,080	62,404,489	3,354,756	105,176,808
1901...	a131,790,400	75,913,600	71,001,713	2,818,757	137,826,406
1902...	a334,010,800	52,978,240	112,420,253	2,119,031	194,501,757
1903...	a607,407,360	30,461,760	133,472,398	3,235,597	168,707,995
1904...	a546,030,153	50,193,920	142,344,433	.....	181,292,205

a. Gross weight of ore.

AMERICAN COPPER EXPORTS.

The United States government estimates of exports of copper, including ingot and various forms of refined copper, matte, blister copper and ores, and manufactured products, from 1864 until 1902, inclusive are as follows:

(Cwts. and Pounds.)

Year Ending—	Ore and Matte. Cwts.	Refined. Pounds.	Total Value.
June 30, 1864.....	109,581	102,831	\$ 432,570
1865.....	225,197	1,572,382	1,544,870
1866.....	215,080	123,444	936,211
1867.....	87,731	4,637,867	791,901
1868.....	92,612	1,350,896	922,409
1869.....	121,418	1,134,360	592,698
1870.....	19,198	2,214,658	1,042,246
1871.....	54,445	581,650	915,431
1872.....	35,564	267,868	287,735
1873.....	45,252	38,958	259,076
1874.....	13,326	503,160	467,208
1875.....	51,305	5,123,470	1,815,266
1876.....	15,304	14,304,160	3,526,410
1877.....	21,432	13,461,553	3,023,394
1878.....	32,947	11,297,876	2,488,921
1879.....	23,070	17,207,739	2,933,205
1880.....	21,623	4,206,258	849,218
1881.....	9,958	4,865,407	876,395
1882.....	25,936	3,340,531	748,456
1883.....	112,923	8,221,363	2,348,004
1884.....	386,140	17,044,760	5,595,859
1885.....	432,300	44,731,858	10,187,024
Dec. 31, 1886.....	417,520	19,553,421	4,380,322
1887.....	501,280	12,471,393	4,114,456
1888.....	794,960	31,706,527	11,897,240
1889.....	818,500	16,813,410	10,209,722
1890.....	431,411	10,971,899	5,918,395
1891.....	672,120	69,279,024	15,703,543
1892.....	943,040	30,515,736	10,162,870
1893.....	835,040	138,984,128	18,935,497
1894.....	87,040	162,393,000	16,143,094
1895.....	276,480	121,328,390	14,938,309
1896.....	414,265	259,223,924	31,035,211
1897.....	181,280	277,255,742	32,755,053
1898.....	186,860	291,955,905	35,545,251
1899.....	74,540	246,826,331	43,485,654
1900.....	200,140	337,973,751	58,875,439
1901.....	292,260	194,249,828	36,071,448
1902.....	201,992	354,668,849	46,811,729
1903.....	137,659	310,729,524	44,365,155
1904.....	.....	554 550 030	74,816,934

AMERICAN COPPER EXPORTS BY DESTINATIONS.

(Pounds Avoirdupois.)				
Destination.	1900.	1902.	1903.	1904.
Great Britain and Ireland.	63,522,445	88,972,029	47,140,717	112,224,871
Holland.....	101,398,394	96,358,472	96,927,346	147,678,581
France.....	67,725,989	63,519,881	53,745,221	99,88,455
Germany.....	67,348,848	56,604,753	71,130,077	103,825,445
Belgium.....	12,554,191	8,431,560	4,207,720	9,365,791
Austria-Hungary.....	11,258,115	28,539,742	16,516,663	29,064,494
Russia.....	5,650,423		10,411,679	22,333,578
Italy.....	5,550,285	9,108,904	7,774,016	15,297,091
Other Countries.....	2,965,061	3,133,508	2,874,085	14,871,724
Totals.....	337,973,751	354,668,849	310,729,524	554,550,030

AMERICAN EXPORTS BY PORTS.

(Pounds Avoirdupois.)				
Port of Export.	1900.	1902.	1903.	1904.
Baltimore.....	86,264,231	103,607,256	88,296,071	171,386,493
Boston.....	1,496,387	426,069	512,053	838,321
Newport News, Va...	2,016,000	5,070,026	1,969,177	7,626,951
Norfolk, Va.....	.....	598,339	1,771,993	560,536
New York.....	230,178,643	236,622,515	211,879,055	360,644,287
Philadelphia.....	12,468,680	5,804,743	3,845,307	9,718,814
New Orleans.....	3,937,350	1,819	3,014	121,835
Detroit.....	469,819	812,828	611,327	1,187,706
Port Huron, Mich....	149,525	208,849	261,820	532,841
Burlington, Vt.....	678,589	.....	491,921	700,561
Miscellaneous.....	314,527	1,516,405	1,087,786	1,231,685
Totals.....	337,973,751	354,668,849	310,729,524	554,550,030

AMERICAN COPPER SUPPLY.

(Pounds Avoirdupois.)					
Year.	Domestic Produ'n.	Imports.	Total Supply.	Exports.	Net Supply.
1892...	344,998,679	8,066,647	353,065,326	96,515,736	256,549,590
1893...	329,354,398	11,045,297	340,399,695	188,984,128	151,415,567
1894...	354,188,374	11,445,441	365,633,815	168,143,000	197,490,815
1895...	380,613,404	14,616,223	395,229,627	136,528,390	258,701,237
1896...	460,061,430	17,297,272	477,358,702	282,105,860	195,252,842
1897...	494,078,274	28,578,420	522,656,694	288,662,340	233,994,354
1898...	526,512,987	73,916,467	600,429,454	321,023,873	279,405,581
1899...	568,666,921	95,722,340	664,389,261	252,876,480	411,512,781
1900...	606,117,166	105,176,808	711,293,974	348,402,853	362,891,121
1901...	602,072,519	137,826,406	739,898,925	222,137,911	517,761,014
1902...	659,225,014	194,501,757	853,726,771	354,668,849	499,057,922
1903...	729,943,131	168,707,995	898,651,126	310,729,524	587,921,602
1904...	812,537,267	181,292,205	993,829,472	567,638,552	426,190,920

AMERICAN COPPER TRADE.

This table, compiled by the Metallgesellschaft & Metallurgische Gesellschaft A.-G., of Frankfort-on-Main, Germany, is based upon the official statistics of the United States government. The production, given in the first column, includes copper produced from imported ores and matte, as well as copper from domestic ore and régulus:

(Metric Tons.)				
Year.	Production.	Imports.	Exports.	Supply.
1892.....	151,163	784	43,004	108,943
1893.....	152,272	2,512	87,492	67,292
1894.....	164,095	1,563	77,089	88,569
1895.....	178,341	4,253	63,759	118,835
1896.....	219,328	5,186	128,548	95,966
1897.....	230,185	7,543	131,730	105,998
1898.....	250,000	24,646	150,721	123,925
1899.....	273,000	32,516	116,629	188,887
1900.....	283,000	31,303	160,403	153,900
1901.....	317,500	33,600	110,500	240,600
1902.....	341,100	46,925	184,800	203,225
1903.....	320,000	62,200	152,000	230,200
1904.....	378,000	65,000	263,000	180,000

BRITISH AND FRENCH STOCKS OF COPPER.

The following table gives the estimates of stocks of refined copper on hand in Great Britain and France, on the first day of January of each year named. The first column gives actual stocks on hand, the second column giving the "visible supply," which in addition to stocks on hand includes shipments afloat from Chile and Australia to European ports:

(Long Tons.)		
Year.	Public Stocks.	Visible Supply.
1888.....	35,001.....	.....
1889.....	96,194.....	104,091
1890.....	94,942.....	98,847
1891.....	62,449.....	65,366
1892.....	53,486.....	.....
1893.....	51,556.....	.....
1894.....	43,428.....	.....
1895.....	51,575.....	.....
1896.....	43,604.....	45,817
1897.....	31,776.....	34,927
1898.....	27,895.....	31,955
1899.....	22,346.....	27,913
1900.....	17,517.....	22,935
1901.....	24,435.....	28,921
1902.....	15,701.....	22,063
1903.....	11,215.....	16,540
1904.....	5,601.....	13,851
1905.....	10,009.....	16,734
1906.....	5,683.....	12,983

ENGLISH COPPER TRADE.

(Long Tons.)

Year.	Copper.	Imports		Exports.	Apparent Consumption.
		Ore and Matte.	Total.		
1860.....	13,142	13,715	26,857	26,117	.....
1865.....	23,137	23,922	47,059	41,398	.....
1870.....	30,724	27,025	57,749	53,006	.....
1875.....	41,931	29,483	71,414	51,870	.....
1876.....	39,145	36,191	75,336	52,468	.....
1877.....	39,743	53,582	93,325	54,088	.....
1878.....	39,360	48,212	87,572	55,001	.....
1879.....	46,670	50,421	97,091	62,412	30,774
1880.....	36,509	56,225	92,734	59,482	32,879
1881.....	32,170	54,057	86,227	61,689	31,607
1882.....	35,509	58,366	93,875	55,683	42,877
1883.....	35,653	63,493	99,146	59,350	40,469
1884.....	39,767	69,623	109,390	64,691	51,263
1885.....	41,933	81,616	123,549	62,080	54,323
1886.....	42,969	65,046	108,015	60,511	41,158
1887.....	29,198	73,891	103,089	69,453	53,096
1888.....	44,063	90,867	135,470	^a 72,066	42,562
1889.....	^b 38,576	101,407	139,983	75,627	65,759
1890.....	^c 49,461	91,788	141,249	89,747	66,170
1891.....	44,213	94,403	138,616	76,056	59,223
1892.....	^d 35,015	99,356	134,371	82,542	^e 48,367
1893.....	41,829	88,003	129,832	70,986	66,817
1894.....	56,157	68,851	125,008	54,689	^f 50,330
1895.....	42,135	77,806	119,941	65,990	^f 50,692
1896.....	60,458	75,398	135,856	59,334	^f 76,036
1897.....	60,428	76,127	136,555	56,542	^f 69,787
1898.....	67,978	71,726	139,704	63,256	^f 69,284
1899.....	58,880	82,730	141,610	75,271	^f 60,877
1900.....	70,247	84,694	154,941	56,997	^f 81,896
1901.....	66,764	82,814	149,578	70,396	^f 70,178
1902.....	90,022	70,179	160,201	69,156	^f 80,223
1903.....	62,879	70,047	132,926	76,305	^f 56,621
1904.....	88,282	69,615	157,897	73,447	^f 55,886

a. Including 22,557 tons of Chile bars transferred to France.

b. Including 1,166 tons of Chile bars transferred from France to England.

c. Including 3,501 tons of Chile bars transferred from France to England.

d. Including 3,585 tons of Chile bars transferred from France to England.

e. Add 4,001 tons for comparison with former years, the difference arising from the new method of making up stock.

f. Deducting copper contents of sulphate exported (13,078 tons in 1896, 10,045 tons in 1899, 10,728 tons in 1900, 9,004 tons in 1901 and 10,822 tons in 1902).

GERMAN COPPER TRADE.

(Compiled by Metalgesellschaft & Metallurgische Gesellschaft A.-G.)

(Metric Tons.)

Year.	Production.	Imports.	Exports.	Consumption.
1884.....	18,113	13,819	6,906	25,026
1885.....	19,928	13,168	5,706	27,390
1886.....	19,314	11,913	6,510	24,717
1887.....	20,192	12,427	5,154	27,465
1888.....	21,017	8,082	4,530	24,569
1889.....	24,160	29,643	7,135	46,668
1890.....	24,427	31,408	8,428	47,407
1891.....	24,092	34,182	6,247	52,027
1892.....	24,781	32,498	6,598	50,681
1893.....	24,011	38,455	7,517	54,949
1894.....	25,722	37,032	6,609	56,145
1895.....	25,777	44,365	6,329	63,813
1896.....	29,319	56,115	5,996	79,438
1897.....	29,408	67,573	7,183	89,798
1898.....	30,695	73,291	6,972	97,014
1899.....	34,634	70,091	7,061	97,664
1900.....	30,929	83,503	5,505	108,927
1901.....	31,317	58,620	5,097	84,840
1902.....	30,591	76,050	4,678	101,963
1903.....	31,214	83,261	4,333	110,142
1904.....	30,262	110,231	4,223	136,270

FRENCH COPPER TRADE.

(Metric Tons.)

Year.	Production	Imports.	Exports.	Consumption.
1892.....	6,400	24,154	2,116	28,438
1893.....	6,600	26,060	2,204	30,456
1894.....	6,400	26,756	2,467	30,689
1895.....	8,245	32,656	3,163	37,738
1896.....	6,544	40,136	3,456	43,224
1897.....	7,400	48,028	3,559	51,869
1898.....	7,834	45,575	4,044	49,365
1899.....	6,600	49,515	6,882	49,233
1900.....	6,400	51,962	5,736	52,626
1901.....	7,000	41,196	5,122	43,074
1902.....	7,300	49,094	3,485	52,909
1903.....	7,100	46,834	4,658	49,276
1904.....	7,000	56,528	5,369	58,157

AUSTRO-HUNGARIAN COPPER TRADE.

(Metric Tons.)

Year.	Production.	Imports.	Exports.	Consumption.
1892.....	1,295	8,644	342	9,597
1893.....	1,396	11,822	434	12,784
1894.....	1,726	13,383	255	14,854
1895.....	1,276	11,747	151	12,872
1896.....	1,366	13,666	228	14,804
1897.....	1,426	15,926	159	17,193
1898.....	1,343	17,442	173	18,612
1899.....	1,479	16,185	534	17,130
1900.....	1,200	18,970	471	19,699
1901.....	1,150	17,504	435	18,219
1902.....	1,350	18,256	436	19,170
1903.....	1,400	18,704	1,054	19,060
1904.....	1,463	22,532	747	23,248

RUSSIAN COPPER TRADE.

(Metric Tons.)

Year.	Production.	Imports.	Exports.	Consumption.
1892.....	4,978	6,568	....	11,546
1893.....	5,100	8,756	....	13,856
1894.....	5,409	6,666	....	12,075
1895.....	5,854	8,100	....	13,954
1896.....	5,832	12,433	....	18,265
1897.....	6,941	12,507	....	19,448
1898.....	7,291	10,200	....	17,491
1899.....	7,533	6,300	....	13,833
1900.....	8,100	6,100	....	14,200
1901.....	8,100	6,000	....	14,100
1902.....	8,800	8,700	....	17,500
1903.....	10,500	7,300	....	17,800
1904.....	10,900	13,100	....	24,000

ITALIAN COPPER TRADE.

(Metric Tons.)

Year.	Production	Imports.	Exports.	Consumption.
1892.....	2,564	2,139	168	4,535
1893.....	2,371	3,043	157	5,257
1894.....	2,670	3,706	32	6,344
1895.....	2,375	4,350	84	6,641
1896.....	2,842	4,509	383	6,968
1897.....	2,980	5,032	222	7,790
1898.....	3,230	5,028	462	7,796
1899.....	3,032	6,006	1,355	7,683
1900.....	2,797	6,224	676	8,345
1901.....	3,483	5,982	100	9,365
1902.....	3,863	7,050	165	10,748
1903.....	3,900	6,096	162	9,834
1904.....	3,700	11,492	180	15,012

MISCELLANEOUS EUROPEAN COPPER TRADE.

Sweden, Norway, Denmark, Switzerland, Spain, Portugal and Balkan states.
(Not including Spanish and Portuguese Production.)

(Compiled by Metallegesellschaft & Metallurgische Gesellschaft A.-G.)
(Metric Tons.)

Year.	Production.	Imports.	Exports.	Consumption.
1892.....	1,400	1,100	800	1,700
1893.....	1,600	1,400	1,000	2,000
1894.....	1,600	1,400	700	2,100
1895.....	1,500	1,400	1,100	1,800
1896.....	1,700	1,400	800	2,300
1897.....	1,700	1,500	1,200	2,000
1898.....	1,500	1,700	1,500	1,700
1899.....	2,300	1,800	2,100	2,000
1900.....	2,500	1,600	2,100	2,000
1901.....	3,100	2,200	2,700	2,600
1902.....	10,000	2,300	9,900	2,400
1903.....	12,200	1,500	11,300	2,400
1904.....	11,500	1,500	10,400	2,600

WORLD'S CONSUMPTION OF RAW COPPER.

(1895-1904.)

(Compiled by Metallegesellschaft & Metallurgische Gesellschaft A.-G.)

(Metric Tons.)

Country	1895.	1899.	1900.	1901.	1902.	1903	1904.
United States....	118,835	188,887	153,900	221,000	203,225	230,200	180,000
Great Britain....	91,551	86,528	108,782	105,243	120,576	107,538	128,728
Germany.....	63,813	97,664	108,927	84,905	101,963	110,142	136,270
France.....	38,174	49,233	52,626	42,600	52,909	49,276	56,785
Austria-Hungary.	12,872	17,130	19,699	18,358	19,170	19,050	23,248
Russia.....	14,000	13,800	14,200	14,100	17,500	17,800	24,000
Italy.....	6,641	7,683	8,345	8,882	10,385	9,834	15,012
Belgium.....	5,000	5,500	6,250	6,500	6,700	6,100	7,800
Netherlands.....	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Misc. European...	1,800	2,000	2,000	2,600	2,900	2,400	2,600
Eastern Asia.....	8,000	9,000	10,100	8,000	15,500	15,500	38,000
Miscellaneous.....	700	900	800	900	1,100	1,800	3,800
Totals.....	364,486	481,025	488,329	515,788	556,000	572,040	618,643

AVERAGE AMERICAN AND ENGLISH PRICES.

The following table of average annual prices of copper in England and the United States is based upon the New York price for Lake copper and the London price for Standard copper. The last two columns give the American prices in cents and fractions and the English equivalent in sterling. English prices are for long tons of 2,240 pounds, and American prices for pounds avoirdupois, the last column, giving English equivalent of the American prices, being figured in long tons.

Year.	English Prices.				American Prices.	
	Lowest. £ s. d.	Highest. £ s. d.	Fluctuation. £ s. d.	Average. £ s. d.	Average Cents.	Average. £ s. d.
1880....	54 10 0	74 0 0	10 10 0	62 14 7	21 ⁷ / ₈	99 0 8
1881....	57 0 0	72 10 0	15 10 0	61 16 9	18 ³ / ₄	84 0 8
1882....	63 0 0	71 10 0	8 10 0	66 10 5	19 ¹ / ₄	88 6 11
1883....	57 0 0	67 10 0	9 10 0	62 17 11	16 ¹ / ₂	76 3 7
1884....	47 5 0	58 0 0	10 15 0	53 17 6	13	59 19 0
1885....	38 10 0	61 12 6	23 2 6	43 11 0	10.67	49 6 5
1886....	38 10 0	43 15 0	5 5 0	40 1 8	11 ¹ / ₄	51 1 10
1887....	38 7 6	85 5 0	46 17 6	46 0 6	13.85	64 0 0
1888....	73 0 0	105 0 0	32 0 0	81 11 3	16.78	77 10 1
1889....	35 0 0	80 0 0	45 0 0	49 14 8	13.49	62 6 5
1890....	46 10 0	61 12 6	15 2 6	54 5 3	15.60	72 1 10
1891....	44 1 3	56 10 0	12 8 9	51 9 4	12.76	58 19 1
1892....	43 10 0	47 18 9	4 8 9	45 13 2	11.56	53 8 4
1893....	40 12 6	46 16 3	6 3 9	43 15 6	10.75	49 13 10
1894....	37 17 6	43 0 0	5 2 6	40 7 4	9.52	44 0 0
1895....	38 13 9	47 8 9	8 15 0	42 19 7	10.73	49 12 0
1896....	40 10 0	50 8 9	9 18 9	46 18 1	10.98	50 14 9
1897....	47 0 0	51 15 0	4 15 0	49 2 6	11.36	52 10 2
1898....	49 5 0	57 8 9	8 3 9	51 16 7	12.05	55 13 10
1899....	58 1 3	79 2 6	21 1 3	73 13 9	17.76	82 0 11
1900....	70 14 2	78 7 1	7 12 11	73 12 6	16.65	76 18 2
1901....	47 0 0	72 17 6	25 17 6	66 19 8	16.72	77 4 7
1902....	47 10 0	56 15 0	9 5 0	52 11 5	12.16	56 3 8
1903....	53 13 7	64 0 7	10 7 0	58 3 2	13.72	63 4 8
1904....	55 5 0	68 7 6	13 2 6	62 12 2	13.01	60 2 6
1905....	64 2 6	80 12 6	16 10 0	69 9 2	15.89	73 7 9

PRICE OF ELECTROLYTIC COPPER.

The following table gives the average monthly prices of electrolytic wire-bars, on the New York Metal Exchange, for 6 years, 1900 to 1905, inclusive:

Month.	(Cents.)					
	1900.	1901.	1902.	1903.	1904.	1905.
January.....	16.250	16.625	11.550	12.260	12.670	15.150
February.....	16.250	16.625	12.500	12.885	12.415	15.200
March.....	16.250	16.625	12.210	14.510	12.640	15.200
April.....	16.875	16.625	11.975	14.890	13.185	15.180
May.....	16.750	16.625	11.990	14.875	13.060	15.000
June.....	16.250	16.625	12.110	14.640	12.650	15.000
July.....	16.250	16.600	11.900	13.700	12.675	15.110
August.....	16.375	16.600	11.545	13.375	12.630	15.875
September.....	16.500	16.500	11.600	13.660	12.700	16.225
October.....	16.625	16.500	11.590	13.260	13.140	16.500
November.....	16.625	16.500	11.415	13.150	14.425	16.845
December.....	16.625	14.800	11.475	12.290	14.890	18.590

HIGH, LOW AND AVERAGE PRICES OF LAKE COPPER.

1860-1905.

(Cents.)

Year.	Highest		Lowest		Average.
	Price.	Month.	Price.	Month.	
1860	24.000	January	19.750	December	22.875
1861	27.000	December	17.500	July	22.250
1862	32.875	November	20.750	May	21.875
1863	38.750	December	29.000	July	33.875
1864	55.000	July	39.000	January	47.000
1865	50.500	January	28.000	July	39.250
1866	42.000	January	26.500	November	34.250
1867	29.250	January	21.500	December	25.375
1868	24.500	December	21.500	January	23.000
1869	27.000	February	21.500	December	24.250
1870	23.375	November	19.000	March	21.188
1871	27.000	December	21.250	April	24.125
1872	44.000	April	27.125	January	35.563
1873	35.000	January	21.000	November	28.000
1874	25.000	January	19.000	August	22.000
1875	23.875	September	21.500	January	22.688
1876	23.250	January	18.750	August	21.000
1877	20.500	February	17.500	December	19.000
1878	17.625	January	15.500	October	16.563
1879	21.750	November	15.500	January	18.625
1880	25.000	January	17.875	June	21.438
1881	20.375	December	16.000	July	18.188
1882	20.375	January	17.875	April	19.125
1883	18.125	January	14.875	November	16.500
1884	15.000	December	11.000	December	13.000
1885	11.875	February	9.800	May	10.838
1886	12.125	December	10.000	May	11.063
1887	17.750	December	9.950	May	13.850
1888	17.600	November	15.850	January	16.775
1889	17.500	January	11.000	September	13.490
1890	17.250	July	14.000	March	15.600
1891	15.000	January	10.250	December	12.760
1892	12.375	December	10.500	February	11.560
1893	12.500	January	9.600	August	10.750
1894	10.250	January	9.000	June	9.520
1895	12.250	August	9.375	April	10.730
1896	12.000	June	9.750	January	10.980
1897	12.000	January	10.750	November	11.360
1898	13.250	December	11.000	January	12.050
1899	19.375	April	13.250	January	17.760
1900	17.250	April	16.000	February	16.650
1901	17.000	January	13.000	December	16.720
1902	13.500	February	11.000	January	12.160
1903	15.375	March	12.000	December	13.720
1904	15.375	November	12.250	February	13.010
1905	18.875	December	15.000	May	15.890

MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(January-June.)

Year.	January.		February.		March.		April.		May.		June.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860....	24	23½	24	23½	23½	23	23½	23	23½	22½	22½	21½
1861....	20	19	19½	19	19½	19½	19½	19	19½	19½	19	18
1862....	28	27	28	25	25	23	23	21½	21½	20½	23	20½
1863....	35	31	37	35	37	31	31	30	30½	30	30½	30
1864....	41½	39	42	41½	42½	41½	44	42½	44	43	49	44
1865....	50½	46	46	44	44½	34	35	34	34	30	30½	28½
1866....	42	38	38	35½	35½	29½	30	28½	31	29	33	31
1867....	29½	27	27½	27½	27½	24	24½	23½	24½	24	24½	24
1868....	23½	21½	24	22½	24	23½	24½	23½	24½	24	24	23½
1869....	26½	23½	27	26	26½	24	24	23½	24½	23½	23½	22
1870....	22	21½	21½	20½	20½	19	19½	19½	19½	19	20½	19
1871....	22½	22	22½	21½	22	21½	21½	21½	21½	21½	21½	21½
1872....	28½	27½	28½	28½	30½	28½	44	30½	42	36	34½	33
1873....	35	32½	35	34	35	34½	34½	30½	33½	32	31½	29½
1874....	25	24½	25	24½	24½	24	25	24½	25	24½	24½	24½
1875....	23½	21½	22½	21½	21½	21½	21½	21½	23½	22½	23	23
1876....	23½	23	22½	22½	22½	22	22	22	22½	21	21	19½
1877....	19½	19	20½	19½	19½	19	19½	19½	19½	19	19½	19
1878....	17½	17½	17½	17½	17½	16½	17	16½	16½	16½	16½	16½
1879....	16	15½	15½	15½	15½	15½	16	15½	16½	16	16½	16½
1880....	25	21½	24½	24	24	22½	22½	21	21	18	18½	17½
1881....	19½	19½	19½	19½	19½	19	19	18½	18½	18½	18½	16½
1882....	20½	20½	20	19	19½	18½	18½	17½	18½	18	18½	18
1883....	18½	18	17½	17½	17½	17½	16	15½	16	15½	15½	15
1884....	15	14½	15	14½	15	14½	15	14½	14½	14½	14½	14
1885....	11½	10½	11½	10½	11½	10½	11½	10½	11½	10½	11½	11
1886....	11½	11½	11½	11½	11½	11½	11½	11½	11½	10	10½	10
1887....	12	11½	11½	10½	10½	10½	10½	10	10	9½	10½	10
1888....	17½	15½	16½	16	16½	15½	16½	16	16½	16½	16½	16½
1889....	17½	16½	16½	16½	15½	15	16	15½	12½	12	12½	12
1890....	14½	14½	14½	14½	14½	14	14½	14½	15½	14½	16½	15½
1891....	15	14½	14½	14½	14½	13½	13½	13½	13½	12½	13	12½
1892....	11	10½	10½	10½	12	10½	12	11½	12½	12	11½	11½
1893....	12½	12½	12½	12	12	11½	11½	11½	11½	11	11	10½
1894....	10½	10	10	9½	9½	9½	9½	9½	9½	9½	9½	9
1895....	10	9½	9½	9½	9½	9½	9½	9½	10½	9½	10½	10½
1896....	10½	9½	11½	10	11½	10½	11	10½	11½	10½	11½	11½
1897....	12	11½	12	11	11½	11½	11½	11	11½	10½	11½	10½
1898....	11	10½	11½	11½	12	11½	12½	11½	12½	12	11½	11½
1899....	17	13½	18½	17	18	17½	19½	18	19½	18½	18½	17½
1900....	16½	16½	16½	16	17	16½	17½	17	17½	16½	16½	16½
1901....	17	17	17	17	17	17	17	17	17	17	17	17
1902....	11	13	12½	13½	12½	12½	12	12½	12	12½	12½	12½
1903....	12½	13½	12½	12½	15½	13½	15½	14½	15½	14½	15½	14
1904....	13	12½	12½	12½	13	12½	13½	13	13½	13	13½	12½
1905....	15½	15½	15½	15½	15½	15½	15½	15½	15	15	15	15

MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(July-December.)

Year.	July.		August.		September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860....	21½	21½	21½	21½	22	21½	22	21½	21½	20½	20½	19½
1861....	18	17½	19	17½	20½	19	20½	20	22½	20½	27	22½
1862....	24½	22½	24½	24	27	24½	32½	27	32½	30½	31½	30½
1863....	32	29	31	29	32½	31	34½	32½	38½	34½	38½	38½
1864....	55	49	52½	50	52½	47½	48	47	49	47	50	48½
1865....	30½	28	32	30½	32½	31½	33	32½	45½	33	45½	39½
1866....	33½	31	31	30	31½	30½	31	30½	30½	26½	29	26½
1867....	26	24	26½	25½	27½	26½	26½	22½	23	22½	23	21½
1868....	24½	23½	24½	24	24	23½	24	23	24	22½	24½	23½
1869....	22½	21½	23½	21½	23	22	22½	22	22½	22	22	21½
1870....	20½	20½	21½	20½	21½	20½	21	21½	23	21½	22½	22½
1871....	22½	21½	23	22½	22½	22½	23	23½	24½	23½	27	24½
1872....	34	33	35	32½	35½	33	34½	31½	32½	30½	32½	30½
1873....	29	26½	27½	27	27	25½	25½	24	24	21	25	23
1874....	24½	20	21	19	21½	21	22½	21½	23½	22½	23½	23½
1875....	23	22½	23½	23	23½	23½	23½	23	23½	23	23½	23½
1876....	20	19½	19½	18½	21	18½	21½	20½	20½	20	20	19½
1877....	19½	19	19	17½	18½	17½	18	17½	17½	17½	17½	17½
1878....	16½	16	16	16	16½	16	16	15½	15½	15½	16	15½
1879....	16½	16	16	16	17	16½	21½	18	21	21	21½	21
1880....	18½	18½	10½	19	18½	18½	18½	18½	18½	18½	19½	18½
1881....	16½	16	16½	16½	18½	16½	18½	18	19	18½	20½	19½
1882....	18½	18½	18½	18½	18½	18	18½	18	18½	18	18	17½
1883....	15½	15	15	15	15½	15½	15½	15½	15	14½	15	14½
1884....	14½	13½	14	13½	13½	13	13½	12½	13	12½	12½	11
1885....	11½	10½	11½	11	11½	10½	11½	10½	11½	10½	11½	11½
1886....	10½	10	10½	10	11½	10½	11½	11½	12	11½	12½	11½
1887....	10½	10½	10½	10½	11	10½	12½	10½	14½	11½	17½	14½
1888....	16½	16½	17	16½	17½	16½	17½	17½	17½	17½	17½	17½
1889....	12	12	12	12	12	11	11	11	13½	11½	14½	14
1890....	17½	16½	17½	17	17	17	16½	16½	16½	16½	16	15
1891....	12½	12½	12½	12	12½	12½	12½	11½	11½	11	11½	10½
1892....	11½	11½	11½	11½	11½	11½	11½	11½	12	11½	12½	12½
1893....	10½	10½	10½	9½	9½	9½	9½	9½	10½	9½	10½	10½
1894....	9½	9	9	9	9	9	9	9	9	9	10	9
1895....	11½	10½	12½	11½	12½	12	12	11½	11½	11	11	10
1896....	11½	11	11½	10½	10½	10½	10½	10½	11½	10½	11½	11½
1897....	11½	11	11½	11	11½	11½	11½	11	11	10½	11	10½
1898....	11½	11½	12½	11½	12½	12½	11½	12½	11½	12½	12½	12½
1899....	18½	18½	18½	18½	18½	18½	18½	17	17	17	17	16½
1900....	16½	16½	16½	16½	16½	16½	16½	16½	16½	16½	17	16½
1901....	17	16½	16½	16½	16½	16½	16½	16½	16½	16½	17	13
1902....	12	12½	11½	12½	11½	12½	11½	12½	11½	12	11½	12
1903....	14½	13	13½	13	13½	13½	14	13	13½	12½	12½	12
1904....	12½	12½	12½	12½	13	12½	14	12½	15½	13½	15½	14½
1905....	15½	15	16½	15½	16½	16½	16½	16½	17½	16½	18½	17½

TABLE FOR REDUCING ENGLISH INTO AMERICAN PRICES.

The following table shows the corresponding value in cents and fractions, per pound, of copper quoted at various prices from £35—the lowest quotation ever made—to £99 per long ton, exchange being figured on the basis of \$4.85 as equal to one pound sterling:

£36.... 7.79c.	£52....11.25c.	£68....14.72c.	£84....18.18c.
£37.... 8.01c.	£53....11.47c.	£69....14.93c.	£85....18.40c.
£38.... 8.22c.	£54....11.69c.	£70....15.15c.	£86....18.62c.
£39.... 8.44c.	£55....11.90c.	£71....15.37c.	£87....18.83c.
£40.... 8.66c.	£56....12.12c.	£72....15.58c.	£88....19.05c.
£41.... 8.87c.	£57....12.34c.	£73....15.80c.	£89....19.27c.
£42.... 9.09c.	£58....12.55c.	£74....16.02c.	£90....19.48c.
£43.... 9.31c.	£59....12.77c.	£75....16.23c.	£91....19.70c.
£44.... 9.52c.	£60....12.99c.	£76....16.45c.	£92....19.92c.
£45.... 9.74c.	£61....13.20c.	£77....16.67c.	£93....20.13c.
£46.... 9.95c.	£62....13.42c.	£78....16.88c.	£94....20.35c.
£47....10.17c.	£63....13.64c.	£79....17.10c.	£95....20.56c.
£48....10.39c.	£64....13.85c.	£80....17.32c.	£96....20.78c.
£49....10.60c.	£65....14.07c.	£81....17.53c.	£97....21.00c.
£50....10.82c.	£66....14.29c.	£82....17.75c.	£98....21.21c.
£51....11.04c.	£67....14.50c.	£83....17.97c.	£99....21.43c.

PROPORTION OF COPPER TO TOTAL VALUE AMERICAN METAL PRODUCTION.

1888-1901.

Year.	Total Value Metallic Products.	Total Value of Copper Production.	Production of Copper in Pounds.	Percentage Copper Values.
1888.....	\$253,731,822	\$ 33,833,954	231,270,622	13.3
1889.....	267,247,033	26,907,809	231,246,214	10.0
1890.....	305,735,670	30,848,797	265,115,133	10.1
1891.....	300,232,798	38,455,300	295,812,076	12.1
1892.....	307,936,189	37,977,142	352,971,744	12.3
1893.....	250,207,406	32,054,601	339,785,972	12.8
1894.....	218,382,494	33,141,142	364,866,808	15.2
1895.....	282,149,808	38,682,347	392,639,964	13.8
1896.....	287,860,155	49,456,603	460,061,430	17.2
1897.....	302,531,147	54,080,180	494,078,274	17.9
1898.....	343,748,268	61,865,276	526,375,591	18.0
1899.....	525,797,557	101,222,712	581,319,091	19.0
1900.....	550,425,286	98,494,039	602,808,839	17.9
1901.....	524,873,284	86,629,266	601,499,886	16.5
1902.....	642,258,584	76,568,954	659,508,644	11.9
1903.....	624,318,008	91,506,006	698,044,517	15.3
1904.....	542,081,983	105,629,845	812,537,267	19.5

PRICES AND SALES OF AMERICAN COPPER SHARES.

Company.	1903.			1904.		
	Highest.	Lowest.	Sales.	Highest.	Lowest.	Sales.
Adventure.	\$18.00	\$ 2.00	50,070	\$ 7.87	\$ 1.75	55,094
Allouez.....	7.50	3.13	152,262	21.00	3.37	258,301
Amalgamated. ...	79.50	35.50	1,717,341	82.75	43.13	.....
Anaconda	31.12	15.63	7,791	29.75	15.37	.....
Arcadian	6.13	.75	92,842	3.00	.25	30,208
Arnold.....	.95	.25	4,582	1.50	.16	.....
Atlantic.	15.00	7.00	34,087	22.25	7.00	126,120
Bingham	39.00	20.00	126,200	38.75	19.00	257,516
Boston Cons .....	.....	.....	.....	7.87	6.12	126,859
British Columbia .	7.50	2.50	2,018	3.75	3.25	.....
Calumet & Hecla..	550.00	400.00	5,371	700.00	435.00	4,395
Centennial.	31.75	12.00	301,086	33.00	14.63	202,483
Copper Range. ...	75.00	37.00	1,226,030	74.50	38.00	684,467
Daly-West.	48.56	30.50	46,749	36.50	11.63	106,904
Elm River.	5.38	2.00	67,078	4.00	1.75	.....
Franklin.....	14.00	6.75	23,377	15.00	7.87	37,315
Granby.....	5.25	3.63	53,639	5.88	3.00	436,287
Isle Royale	17.50	5.00	44,485	35.50	7.00	206,101
Mass.	18.00	3.00	65,717	10.00	3.00	59,746
Mayflower.....	2.50	.50	15,634	2.00	.45	.....
Michigan.....	11.50	4.50	29,087	11.00	4.25	48,159
Mohawk.	58.00	31.00	120,526	57.75	34.12	111,480
Montreal & Boston	2.88	.55	88,432	1.62	.40	.....
National.	1.25	.75	820	2.00	.40	.....
Old Colony	2.50	.50	20,106	2.50	.87	15,723
Old Dominion. ...	23.50	3.75	119,849	29.00	9.00	136,134
Osceola.....	79.00	43.00	83,419	98.00	53.00	77,537
Parrot	34.00	16.00	59,512	33.50	21.00	72,217
Phoenix	7.50	2.75	23,522	5.00	.50	.....
Quincy.	126.50	80.00	6,438	125.00	80.00	10,023
Rhode Island	3.75	.75	15,815	3.00	1.00	11,594
Santa Fe	3.00	1.00	42,370	3.50	1.12	.....
Shannon.	15.00	7.00	133,571	10.50	6.50	555,011
Tamarack	189.50	75.00	15,239	140.00	94.00	10,236
Tecumseh	1.80	.40	7,505	4.25	.25	.....
Tennessee	33.00	17.25	11,030	43.25	30.00	.....
Trinity.	14.00	4.00	135,573	18.50	4.63	337,510
United Copper ..	32.75	4.00	6,520	7.00	6.00	.....
United States.....	.....	.....	.....	28.75	19.75	633,140
Utah Cons.	33.63	22.00	400,247	47.00	30.00	1,553,158
Victoria	9.00	1.50	52,925	6.37	2.12	.....
Washington.....	.50	.15	2,240	1.00	.10	.....
Winona	13.50	5.50	181,253	13.50	5.00	93,029
Wolverine	77.00	54.00	28,794	110.00	68.00	20,899
Wyandot.....	2.88	.75	54,552	3.00	.50	.....

DIVIDENDS OF AMERICAN COPPER MINES.

Company.	1903.	1904.	1905.	Total.
Anaconda.....	\$1,200,000	\$1,200,000	\$2,400,000	\$26,850,000
Arizona.....	1,003,000	821,000	917,230	6,186,826
Atlantic.....	.....	.....	50,000	990,000
Baltic.....	.....	.....	1,250,000	1,250,000
Boston & Montana.....	1,200,000	10,220,000	4,500,000	43,025,000
Butte & Boston.....	.....	200,000	.....	1,800,000
Calumet & Arizona.....	400,000	1,300,000	1,700,000	3,400,000
Calumet & Hecla.....	3,500,000	4,000,000	5,000,000	92,350,000
Carisa.....	.....	.....	.....	30,000
Centennial-Eureka.....	.....	100,000	.....	2,767,700
Central.....	.....	.....	160,000	2,130,000
Champion.....	300,000	200,000	1,000,000	1,500,000
Cliff.....	.....	.....	.....	2,518,620
Colusa-Parrot.....	.....	.....	.....	1,760,000
Copper Falls.....	.....	.....	.....	100,000
Dalton & Lark.....	.....	.....	.....	350,000
Daly-West.....	1,334,000	1,044,000	218,000	5,067,000
Ducktown.....	.....	105,633	169,653	544,707
Ferris-Haggarty.....	.....	.....	.....	15,000
Franklin.....	.....	.....	.....	1,240,000
Granby.....	133,630	.....	399,991	533,621
Greene Cons.....	431,820	1,123,200	1,973,780	3,748,800
Hadley Cons.....	.....	.....	15,000	15,000
Horn Silver.....	20,000	80,000	40,000	5,482,000
Iron Silver.....	200,000	250,000	400,000	3,500,000
Kearsarge.....	.....	.....	.....	160,000
Le Roi No. 2.....	.....	58,000	86,400	432,00
Mammoth.....	60,000	120,000	.....	1,980,000
Minnesota.....	.....	.....	.....	1,820,000
Montana O. P. Co.....	648,000	486,000	324,000	4,104,000
Mountain.....	143,000	.....	.....	3,776,250
National.....	.....	.....	.....	320,000
North Butte.....	.....	.....	.....	400,000
Old Dominion.....	.....	.....	.....	144,000
Osceola.....	.....	192,300	384,600	4,824,200
Parrot.....	.....	229,850	344,775	6,347,950
Pewabic.....	.....	.....	.....	1,000,000
Phoenix.....	.....	.....	.....	20,000
Pride of the West.....	.....	.....	.....	15,000
Quincy (Mich.).....	550,000	500,000	600,000	15,570,000
Quincy (Utah).....	.....	.....	.....	959,370
Red Bird.....	36,000	36,000	.....	72,000
Ridge.....	.....	.....	.....	100,000

DIVIDENDS OF AMERICAN COPPER MINES. (Continued.)

Company.	1903.	1904.	1905.	Total.
Standard	40,000	.....	.....	40,000
Tamarack .....	.....	90,000	120,000	8,700,000
Tennessee	218,750	218,750	.....	437,500
Trimountain	300,000	.....	.....	300,000
Tyee .....	.....	136,800	.....	136,800
United States .....	.....	.....	780,000	780,000
United Verde	2,025,000	1,557,000	2,025,000	19,005,680
Utah Cons.	954,000	900,000	1,800,000	4,386,000
Wolverine	330,000	450,000	660,000	2,430,000
Totals	14,977,200	25,618,533	27,318,429	285,415,029
Amalgamated	3,078,000	3,078,000	6,933,000	32,745,127
Copper Range .....	.....	.....	1,536,086	1,536,086
United	300,000	300,000	900,000	1,500,000
Grand Totals ...	18,355,200	28,996,533	36,687,515	321,196,242

LAKE SUPERIOR DIVIDENDS.

Name of Company	1849-1905.		Number of Dividends.	Total Amount.
	Present Status.	Dates Paid. First. Last.		
Atlantic	a	1878 1905	19	\$ 990,000
Baltic	b	1905 1905	4	1,250,000
Calumet	c	1870 1871	3	300,000
Calumet & Hecla	b	1871 1905	132	91,400,000
Central	c	1864 1905	31	2,130,000
Champion	b	1903 1905	15	1,500,000
Cliff	d	1849 1867	37	2,518,620
Copper Falls	a	1864 1871	3	100,000
Franklin	b	1863 1894	21	1,240,000
Hecla	c	1869 1871	7	650,000
Kearsarge	e	1890 1897	3	160,000
Minnesota	f	1854 1876	19	1,820,000
National	a	1861 1872	9	320,000
Osceola	b	1878 1905	56	4,824,200
Pewabic	g	1862 1873	11	1,000,000
Phoenix	a	1877 1877	1	20,000
Quincy	b	1862 1905	74	15,570,000
Ridge	h	1873 1880	4	100,000
Tamarack	b	1888 1905	39	8,700,000
Trimountain	b	1903 1903	2	300,000
Wolverine	b	1898 1905	15	2,430,000
Totals			503	\$137,322,820
Copper Range Cons.			4	1,536,086
Grand Totals			507	\$138,858,906

- a. Idle.
 b. Active.
 c. Absorbed by Calumet & Hecla.
 d. Absorbed by Tamarack.
 e. Absorbed by Osceola.
 f. Absorbed by Michigan.
 g. Absorbed by Quincy.
 h. Absorbed by Mass.

DIVIDENDS OF LAKE SUPERIOR MINES.

1849-1872.				
	1849.	1850.	1851.	1852.
Cliff	\$ 60,000	\$ 84,000	\$ 60,000	\$ 60,000
Totals.....	\$ 60,000	\$ 84,000	\$ 60,000	\$ 60,000
	1853.	1854.	1855.	1856.
Cliff	\$ 90,000	\$ 108,000	\$ 78,000	\$ 180,000
Minnesota.....		90,000	90,000	200,000
Totals.....	\$ 90,000	\$ 198,000	\$ 168,000	\$ 380,000
	1857.	1858.	1859.	1860.
Cliff	\$ 180,000	\$ 160,000	\$ 180,000	\$
Minnesota.....	300,000	300,000	180,000	120,000
Totals.....	\$ 480,000	\$ 460,000	\$ 360,000	\$ 120,000
	1861.	1862.	1863.	1864.
Cliff	\$ 80,000	\$ 80,000	\$ 180,000	\$ 320,000
Minnesota.....	100,000	160,000	160,000	60,000
National	80,000	80,000		80,000
Pewabic.....		60,000	120,000	200,000
Quincy		60,000	200,000	280,000
Franklin.....			60,000	100,000
Central				50,000
Copper Falls.....				60,000
Totals.....	\$ 260,000	\$ 440,000	\$ 720,000	\$1,150,000
	1865.	1866.	1867.	1868.
Cliff	\$ 200,000	\$ 120,000	\$ 60,000	\$
National	40,000			
Quincy.....	160,000			60,000
Franklin.....	60,000			
Central.....	50,000	50,000	50,000	40,000
Totals.....	\$ 510,000	\$ 170,000	\$ 110,000	\$ 100,000
	1869.	1870.	1871.	1872.
Cliff	\$	\$	\$ 100,000	\$ 100,000
Minnesota.....				50,000
National			20,000	20,000
Pewabic.....			20,000	40,000
Quincy	40,000	120,000	140,000	250,000
Franklin.....			20,000	40,000
Central	70,000	80,000	50,000	80,000
Copper Falls.....			40,000	
Hecla	100,000	300,000	250,000	
Calumet.....		200,000	100,000	
Calumet & Hecla...			900,000	2,400,000
Totals.....	\$ 210,000	\$ 700,000	\$1,640,000	\$3,080,000

DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)
1873-1888.

	1873.	1874.	1875.	1876.
Minnesota.....	\$	\$	\$	\$ 10,000
Pewabic	20,000	.....	.....	.....
Quincy	100,000	160,000	220,000	160,000
Central	160,000	160,000	80,000	100,000
Calumet & Hecla ...	2,000,000	1,600,000	1,600,000	1,600,000
Ridge.....	50,000	20,000	20,000	.....
Totals	\$2,330,000	\$1,940,000	\$1,920,000	\$1,870,000

	1877.	1878.	1879.	1880.
Cliff	\$	\$	\$ 38,620	\$
Quincy	80,000	100,000	40,000	220,000
Central	140,000	100,000	80,000	100,000
Calumet & Hecla ...	1,600,000	1,600,000	1,600,000	2,500,000
Ridge.....	.....	.....	.....	10,000
Phoenix.....	20,000	.....	.....	.....
Atlantic.....	.....	20,000	.....	40,000
Osceola .....	.....	40,000	60,000	210,000
Totals	\$1,840,000	\$1,860,000	\$1,818,620	\$3,080,000

	1881.	1882.	1883.	1884.
Quincy	\$ 320,000	\$ 520,000	\$ 380,000	\$ 280,000
Franklin .....	.....	.....	.....	80,000
Central	120,000	50,000	60,000	40,000
Calumet & Hecla ...	2,000,000	2,000,000	2,000,000	800,000
Atlantic.....	.....	80,000	80,000	40,000
Osceola	225,000	200,000	150,000	87,500
Totals	\$2,665,000	\$2,850,000	\$2,670,000	\$1,327,500

	1885.	1886.	1887.	1888.
Quincy	\$ 180,000	\$ 240,000	\$ 200,000	\$ 360,000
Franklin	40,000	80,000	40,000	120,000
Central	30,000	40,000	40,000	70,000
Calumet & Hecla ...	1,700,000	1,500,000	1,000,000	2,000,000
Atlantic.....	20,000	40,000	40,000	120,000
Osceola .....	.....	.....	50,000	150,000
Tamarack.....	.....	.....	.....	440,000
Totals	\$1,970,000	\$1,900,000	\$1,370,000	\$3,260,000

DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1889-1904.

	1889.	1890.	1891.	1892.
Quincy	\$ 280,000	\$ 320,000	\$ 450,000	\$ 350,000
Franklin	80,000	80,000	80,000	160,000
Central	40,000	20,000	20,000	.....
Calumet & Hecla ...	1,500,000	2,000,000	2,000,000	2,000,000
Atlantic	80,000	100,000	40,000	.....
Osceola	50,000	225,000	150,000	150,000
Tamarack	640,000	590,000	800,000	600,000
Kearsarge .....	.....	80,000	.....	.....
Totals	\$2,670,000	\$3,415,000	\$3,540,000	\$3,260,000

	1893.	1894.	1895.	1896.
Pewabic	\$ 400,000	\$	\$ 140,000	\$
Quincy	300,000	400,000	600,000	1,000,000
Franklin	120,000	80,000	.....	.....
Calumet & Hecla ...	2,000,000	1,500,000	2,000,000	2,500,000
Osceola	100,000	.....	100,000	125,000
Tamarack	600,000	400,000	400,000	360,000
Kearsarge .....	.....	.....	40,000	.....
Totals	\$3,520,000	\$2,380,000	\$3,280,000	\$3,985,000

	1897.	1898.	1899.	1900.
Quincy	\$ 800,000	\$1,000,000	\$ 950,000	\$ 900,000
Calumet & Hecla ...	4,000,000	5,000,000	10,000,000	7,000,000
Atlantic	40,000	40,000	.....	80,000
Osceola	191,000	277,250	558,450	571,200
Tamarack	360,000	480,000	600,000	1,020,000
Kearsarge	40,000	.....	.....	.....
Wolverine .....	.....	60,000	210,000	240,000
Totals	\$5,431,000	\$6,857,250	\$12,318,450	\$9,811,200

	1901.	1902.	1903.	1904.
Quincy	\$ 900,000	\$ 700,000	\$ 550,000	\$ 500,000
Calumet & Hecla ...	4,500,000	2,500,000	3,500,000	4,000,000
Atlantic	80,000	.....	.....	.....
Osceola	576,900	.....	.....	192,300
Tamarack	1,200,000	.....	.....	90,000
Wolverine	240,000	240,000	330,000	450,000
Champion .....	.....	.....	300,000	200,000
Trimountain .....	.....	.....	300,000	.....
Totals	7,496,900	3,440,000	4,980,000	\$5,432,300

DIVIDENDS OF LAKE SUPERIOR MINES (Continued.)

1905.	
Quincy.....	\$ 600,000
Central.....	160,000
Calumet & Hecla.....	5,000,000
Atlantic.....	50,000
Osceola.....	384,600
Tamarack.....	120,000
Wolverine.....	660,000
Champion.....	1,000,000
Baltic.....	1,250,000
Total.....	\$9,224,600
Copper Range Cons.....	1,536,086
Grand total.....	\$10,760,686

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES

Company.	Total Assessments.	Total Dividends.	Credit Balance.	Debit Balance.
Adventure Cons....	\$1,850,000	.....	.....	\$1,850,000
Albany & Boston...	840,000	.....	.....	840,000
Allouez.....	2,225,000	.....	.....	2,225,000
Atlantic.....	980,000	\$ 990,000	\$ 10,000	.....
Arcadian.....	1,800,000	.....	.....	1,800,000
Arnold.....	810,000	.....	.....	810,000
Ashbed.....	40,000	.....	.....	40,000
Aztec.....	150,000	.....	.....	150,000
Baltic.....	1,800,000	1,250,000	.....	1,550,000
Belt.....	1,300,000	.....	.....	1,300,000
Bohemian.....	180,000	.....	.....	180,000
Caledonia.....	140,000	.....	.....	140,000
Calumet & Hecla. .	1,200,000	92,350,000	91,150,000	.....
Centennial (Old)...	1,135,000	.....	.....	1,135,000
Centennial (New)...	1,870,000	.....	.....	1,870,000
Central.....	100,000	2,130,000	2,030,000	.....
Champion.....	2,500,000	1,500,000	.....	1,000,000
Cliff.....	111,000	2,518,620	2,407,620	.....
Conglomerate.....	1,300,000	.....	.....	1,300,000
Copper Falls.....	1,000,000	100,000	.....	900,000
Copper Range.....	2,300,000	.....	.....	2,300,000
Delaware.....	2,000,000	.....	.....	2,000,000
Elm River.....	1,200,000	.....	.....	1,200,000

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES. (Cont'd.)

Company.	Total Assessments.	Total Dividends.	Credit Balance.	Debit Balance.
Evergreen Bluff. . .	\$ 225,000	\$	\$	\$ 225,000
Flint Steel.....	264,000	.....	.....	264,000
Forest.....	180,000	.....	.....	180,000
Franklin.....	220,000	1,240,000	1,020,000	.....
Humboldt.....	120,000	.....	.....	120,000
Huron.....	240,000	.....	.....	240,000
Indiana.....	200,000	.....	.....	200,000
Isle Royale.....	2,000,000	.....	.....	2,000,000
Kearsarge.....	180,000	160,000	.....	20,000
Mass Cons.....	1,900,000	.....	.....	1,900,000
Mayflower.....	800,000	.....	.....	800,000
Michigan.....	1,600,000	.....	.....	1,600,000
Miners.....	2,000,000	.....	.....	2,000,000
Mohawk.....	2,100,000	.....	.....	2,100,000
Minnesota.....	456,000	1,820,000	1,364,000	.....
National.....	320,000	320,000	.....	.....
Nonesuch.....	400,000	.....	.....	400,000
Northwest.....	283,000	.....	.....	283,000
Norwich.....	230,000	.....	.....	230,000
Ohio Trap Rock. . .	150,000	.....	.....	150,000
Old Colony.....	1,100,000	.....	.....	1,100,000
Osceola.....	1,700,000	4,824,200	3,124,200	.....
Pennsylvania.....	126,000	.....	.....	126,000
Peninsula.....	400,000	.....	.....	400,000
Pewabic.....	585,200	1,000,000	414,800	.....
Phoenix (Old).....	1,037,500	20,000	.....	1,017,500
Phoenix Cons.....	1,200,000	.....	.....	1,200,000
Quincy.....	200,000	15,570,000	15,370,000	.....
Ridge.....	470,000	100,000	.....	370,000
Rhode Island.....	900,000	.....	.....	900,000
Tamarack.....	320,000	8,700,000	8,380,000	.....
Tamarack Junior. . .	640,000	.....	.....	640,000
Tecumseh.....	500,000	.....	.....	500,000
Trimountain.....	1,900,000	300,000	.....	1,600,000
Toltec.....	500,000	.....	.....	500,000
Victoria.....	1,100,000	.....	.....	1,100,000
Winona.....	1,100,000	.....	.....	1,100,000
Wolverine.....	230,000	2,430,000	2,200,000	.....
Wyandot.....	800,000	.....	.....	800,000
Totals.....	\$55,507,700	\$137,322,820	\$129,661,820	\$48,145,500
Credit Balance..	.....	.....	\$ 81,815,120	.....

ASSESSMENTS OF LAKE SUPERIOR MINES.

Company.	1897.	1898.	1899.	1900.
Adventure.	\$.....	\$.....	\$.....	\$200,000
Allouez.....		80,000		
Arnold.....		180,000	180,000	
Baltic.	100,000	100,000	300,000	
Centennial.	120,000	270,000		270,000
Copper Range.				300,000
Humboldt.....	20,000			
Mass.				200,000
Mohawk.				250,000
National.		200,000		
Tecumseh.	40,000			
Trimountain.....				300,000
Union.	50,000			
Washington.....		8,000		
Totals.....	\$330,000	\$838,000	\$480,000	\$1,520,000

Company.	1901.	1902.	1903.	1904.
Adventure.	\$700,000	\$200,000	\$200,000	\$ 50,000
Allouez.	300,000			300,000
Baltic.	300,000			
Centennial.	180,000			360,000
Mass.	500,000	100,000	100,000	100,000
Michigan.	100,000	200,000	300,000	
Mohawk.	300,000	300,000	200,000	
Old Colony.			100,000	
Phoenix.		100,000	100,000	100,000
Rhode Island.		100,000		
Tecumseh.	55,000			
Trimountain.....	200,000	300,000		
Victoria.....		200,000	100,000	
Winona.		100,000	100,000	
Wyandot.				100,000
Totals.....	\$2,635,000	\$1,600,000	\$1,200,000	\$1,010,000

(1905.)

Company.	
Ashbed.	\$ 40,000
Centennial.....	360,000
Mass.	100,000
Victoria.	100,000
Winona.	100,000
Total.....	\$700,000

CAPITALIZATION OF MICHIGAN COPPER COMPANIES.

Name of Company	Organized under laws	Authorized Capitalization	No. Shares		
			Authorized	Issued	Unissued
Adventure.....	Michigan	\$2,500,000	100,000	100,000	.....
Ahmeek.....	Michigan	1,250,000	50,000	50,000	.....
Allouez.....	Michigan	2,500,000	100,000	100,000	.....
Arcadian.....	New Jersey	3,750,000	150,000	150,000	.....
Arnold.....	Michigan	2,500,000	100,000	62,000	38,000
Ashbed.....	Michigan	1,000,000	40,000	40,000	.....
Atlantic.....	Michigan	2,500,000	100,000	100,000	.....
Baltic.....	Michigan	2,500,000	100,000	100,000	.....
Calumet & Hecla....	Michigan	2,500,000	100,000	100,000	.....
Centennial.....	Michigan	2,500,000	100,000	90,000	10,000
Champion.....	Michigan	2,500,000	100,000	100,000	.....
Copper Range.....	Michigan	2,500,000	100,000	100,000	.....
Copper Range Cons.	New Jersey	38,500,000	385,000	384,209	791
Elm River.....	New Jersey	1,200,000	100,000	100,000	.....
Franklin.....	Michigan	2,500,000	100,000	100,000	.....
Humboldt.....	Michigan	1,000,000	40,000	40,000	.....
Isle Royale.....	New Jersey	3,750,000	150,000	150,000	.....
King Philip.....	Michigan	2,500,000	100,000	100,000	.....
Mass.....	Michigan	2,500,000	100,000	100,000	.....
Mayflower.....	Michigan	2,500,000	100,000	100,000	.....
Michigan.....	Michigan	2,500,000	100,000	100,000	.....
Mohawk.....	Michigan	2,500,000	100,000	100,000	.....
National.....	Michigan	2,500,000	100,000	75,000	25,000
Old Colony.....	Michigan	2,500,000	100,000	100,000	.....
Oneco.....	Michigan	2,500,000	100,000	100,000	.....
Osceola.....	Michigan	2,500,000	100,000	96,150	3,850
Phoenix.....	Michigan	2,500,000	100,000	100,000	.....
*Quincy.....	Michigan	2,500,000	100,000	100,000	.....
Rhode Island.....	Michigan	2,500,000	100,000	100,000	.....
St. Mary's M. L. Co..	New Jersey	5,000,000	200,000	150,000	50,000
Seneca.....	Michigan	1,000,000	40,000	40,000	.....
Superior.....	Michigan	2,500,000	100,000	60,000	40,000
Tamarack.....	Michigan	1,500,000	60,000	60,000	.....
Tecumseh.....	Michigan	2,500,000	100,000	54,959	45,041
Trimountain.....	Michigan	2,500,000	100,000	100,000	.....
Union C. L. & M. Co.	Michigan	2,500,000	100,000	80,000	20,000
Victoria.....	Michigan	2,500,000	100,000	100,000	.....
Winona.....	Michigan	2,500,000	100,000	100,000	.....
Wolverine.....	Michigan	1,500,000	60,000	60,000	.....
Wyandot.....	Michigan	2,500,000	100,000	100,000	.....

Totals..... \$131,950,000 4,175,000 3,942,318 232,682

*Quincy capitalization authorized August, 1906, to be increased to \$3,750,000, in 150,000 shares, per \$25.

NUMBER OF SHAREHOLDERS IN LAKE COPPER COMPANIES.

(1896-1905.)

Company	1896	1898	1900	1901	1902	1903	1904	1905
Adventure.....			1,046	1,288	1,050	1,089	1,283	1,124
Ahmeek.....							114	173
Allouez.....			465	510	554	627	726	537
Atlantic.....	364	401	374	408	417	457	633	460
Baltic.....			513	582	177	17	10	10
Calumet & Hecla	2,464	2,716	3,080	3,413	3,425	3,310	3,258	3,493
Centennial.....		438	439	550	597	630	636	534
Central.....			203	220	189	168	224	162
Champion.....					8	8	8	8
Copper Crown...								433
Eagle River.....								26
Elm River.....						506	562	585
Franklin.....	458	442	945	1,037	1,311	1,438	1,429	1,155
Frontenac.....								6
Hulbert.....								19
King Philip.....								7
Laurium.....								38
Manitou.....								6
Mass.....			477	748				1,051
Mayflower.....			399	423	587	587	594	624
Michigan.....			592	775	933	980	937	870
Middle Range...								4
Mohawk.....			594	940	951	1,001	1,076	1,115
Old Colony.....			598	626	721	746	747	763
Oneco.....								203
Osceola.....	823	1,477	1,512	1,793	1,985	1,988	2,089	1,561
Pacific.....								121
Phoenix.....			352	408	582	612	642	671
Quincy.....	978	1,445	1,540	1,477	1,557	1,612	1,657	1,541
Rhode Island...			1,100	1,256	1,216	1,316	1,339	1,013
St. Louis.....								8
Seneca.....							69	91
South Range...								26
Superior.....								100
Tamarack.....	1,178	1,353	1,169	1,241	1,286	1,239	1,136	1,019
Torch Lake.....								23
Trimountain...			780	882	730	335	41	23
Union.....								323
Victoria.....			796	1,001	1,206	1,275	1,324	1,276
Whealkate.....								5
Winona.....			637	736	909	854	878	758
Wolverine.....	1,333	625	892	1,099	1,223	1,262	1,292	1,266
Wyandot.....								750
Totals....	6,598	8,897	18,503	21,413	21,735	22,068	22,714	23,981

FUTURE PRODUCTION OF COPPER.

1901-2000.

The safest guide to the future is the history of the past. In the following tables an effort is made to estimate the probable production of copper for the future, basing such estimates upon the outputs of the past. The preliminary table next following gives a summary of the production of the Nineteenth Century, by decades, with percentages of increase for each decade:

Decade.	Total Production.	Yearly Average.	Percentage of Increase.
1801-1810.....	91,000	9,100	.....
1811-1820.....	96,000	9,600	5.60
1821-1830.....	135,000	13,500	40.62
1831-1840.....	218,400	21,840	61.77
1841-1850.....	291,000	29,100	33.24
1851-1860.....	506,999	50,699	74.22
1861-1870.....	900,000	90,000	77.51
1871-1880.....	1,189,000	118,900	32.11
1881-1890.....	2,373,398	237,339	99.44
1891-1900.....	3,708,901	370,890	56.22

Analysis of these figures shows that the average decennial percentage of increase for the century was 53.91%; for the last half of the century, 67.90%, and for the last twenty years, during which the electrical industry became a great consumer of copper, the average decennial increase in copper output was 77.83%. Measured by decades the increase in copper production during the Nineteenth Century was forty-fold, from the first decennium to the last, while measured by years, and estimating the production of 1801 at 9,000 tons, the production of 1900, which amounted to 486,363 tons, was just fifty-fold as great as one hundred years earlier. A fifty-fold increase in production during the present century would give an output of 24,318,150 tons of copper for the year 2000.

The actual annual percentage of increase for the Nineteenth Century was a very small fraction more than 4%, measuring outputs by decades, and a fraction over 4%, measuring annual products from 1801 to 1900, inclusive. In order to show the actual increase in production by decades, as compared with the theoretical increase at 4% yearly, the appended table is given, 4% being figured as equal to 50% increase in 10 years, though actually but 48.02%.

Year.	(Long Tons.) Actual Average.	Theoretical Average.
1810.....	9,100	9,000
1820.....	9,600	13,500
1830.....	13,500	19,750
1840.....	21,840	29,625
1850.....	29,100	44,437
1860.....	50,699	66,656
1870.....	90,000	99,984
1880.....	118,900	149,992
1890.....	237,339	224,964
1900.....	370,890	337,447

The foregoing table shows very plainly the effect of electrical demand for the metal, which first became a factor of importance in the ninth decade, shortly after 1880. Previous to that decade the theoretical increase of 4% annually, compounded, exceeds the actual increase in every decade, but after 1880 the actual increase exceeds the theoretical ratio. The actual copper output of 1900 was 486,732 tons, and the theoretical output for that year, based on the average of the decade 1890-1900, with 21¼% increase for 5 years from the mean of 1895, would have been 410,560 tons. It is evident that the average ratio of increase of slightly more than 4% yearly, which ruled during the Nineteenth Century, is not the factor of the present electrical age. What that factor may be is uncertain. The electrification of the globe, while wonderful progress has been made, is not yet a sufficiently established fact to give accurate data for an average ratio of increase in consumption.

The ratio of increase in copper production of the world has been 6% to 8% for several years past. It has grown to be considered an axiom in the copper trade that the normal increase is 8% yearly, but this ratio, while it may be considered the present factor, has not been established for a sufficiently long time to be assured for an indefinite time in the future. The following table gives hypothetical outputs for every tenth year during the Twentieth Century, based upon various percentages of increase, all figured from the actual production of the closing year of the Nineteenth Century. The compound increases, for facility in computation, are taken at slight changes from their actual value, as, for instance, 4% compounded for ten years is figured as 50% increase, instead of 48.02%, the actual figure; 5% is figured at 60%, instead of 62.89%; 7% compounded is figured as 80% in ten years, instead of 79.02%; 8% is figured as only 110% instead of 115.89.

(Long Tons.)

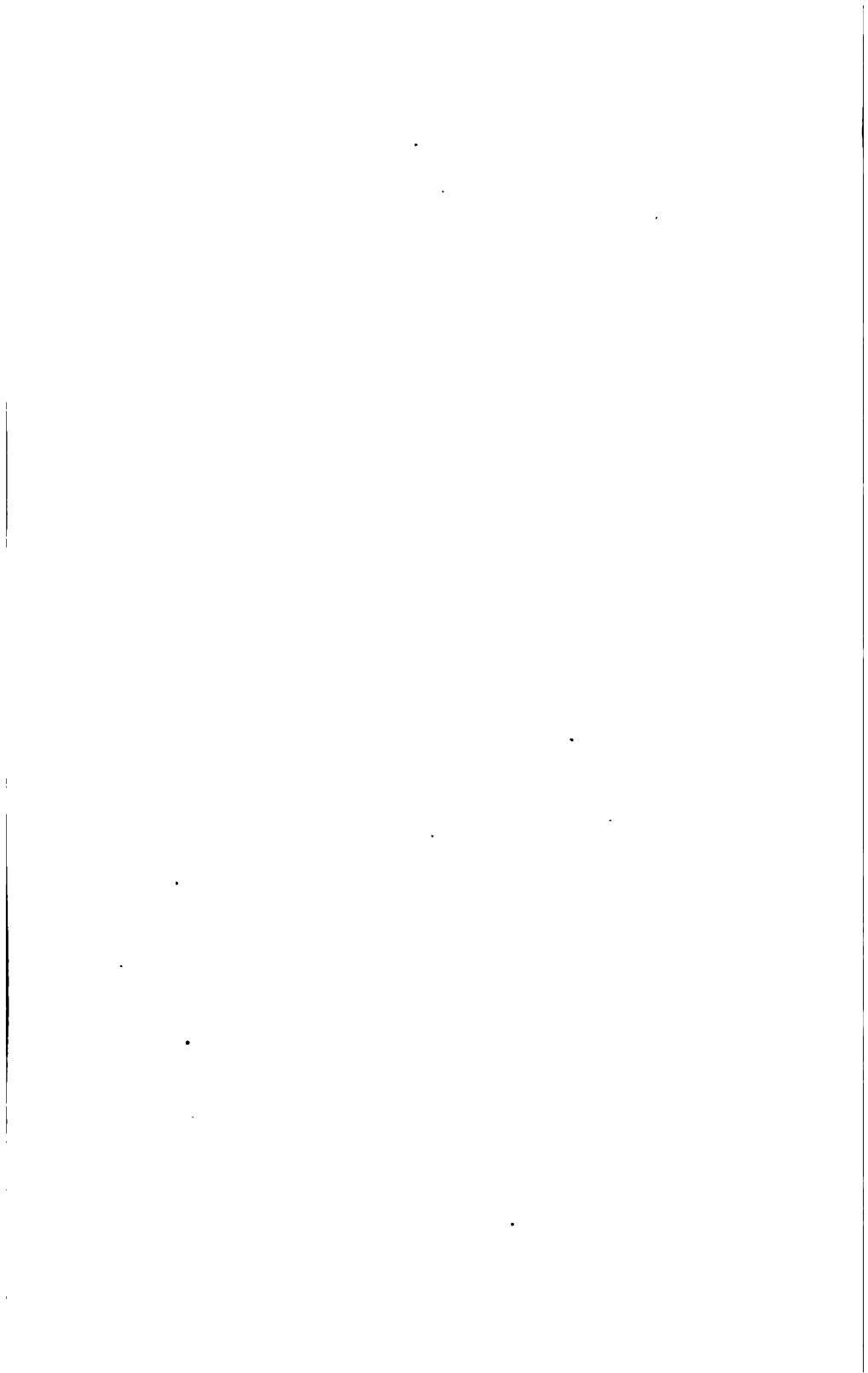
Year.	At 4%.	At 5%.	At 7%.	At 8%.
1900.....	486,732	486,732	486,732	486,732
1910.....	730,098	778,771	876,117	1,022,137
1920.....	1,095,147	1,246,033	1,577,011	2,146,488
1930.....	1,642,720	1,993,654	2,838,621	4,507,625
1940.....	2,464,080	3,189,846	5,126,317	9,466,012
1950.....	3,696,121	5,103,754	9,227,372	19,878,626
1960.....	5,544,181	8,166,007	16,609,269	41,745,115
1970.....	8,316,272	13,065,612	29,896,685	87,664,741
1980.....	12,474,408	20,904,980	53,914,033	184,095,956
1990.....	18,711,613	33,447,968	97,045,260	386,601,507
2000.....	28,067,419	52,516,748	174,681,468	811,863,165

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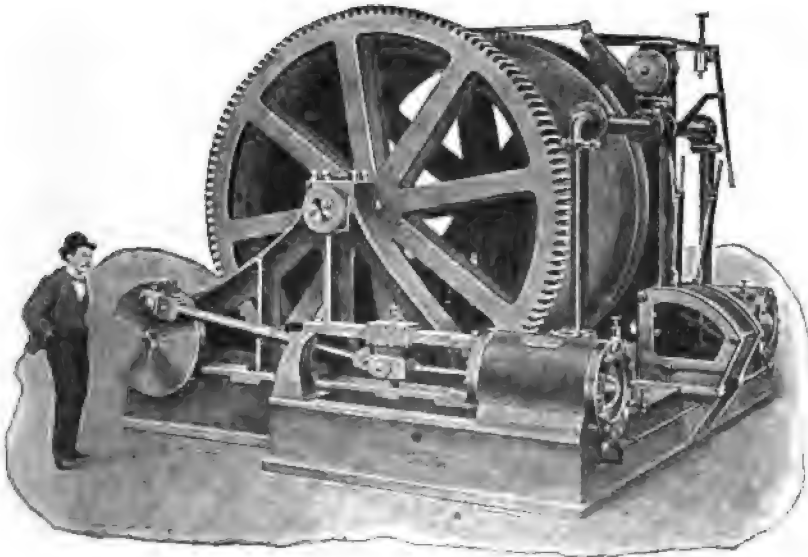
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LIDGERWOOD HOISTING ENGINES

(STEAM AND ELECTRIC)

ARE STANDARD FOR MINES



LIDGERWOOD DOUBLE GEARED MINING HOIST

The engraving illustrates our 18x24 size of Double Geared Mining Hoist. This engine is equipped with our regular form of post brake, which is operated by one of the hand levers shown in the rack, having thumb-latch and quadrant, and is so compounded that it will safely hold any load the engine is capable of hoisting.

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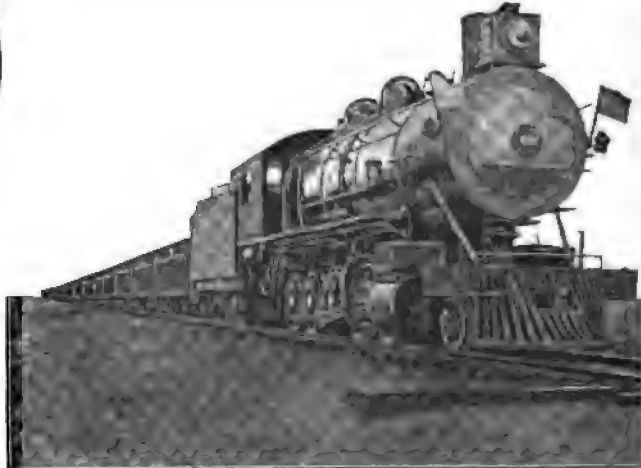


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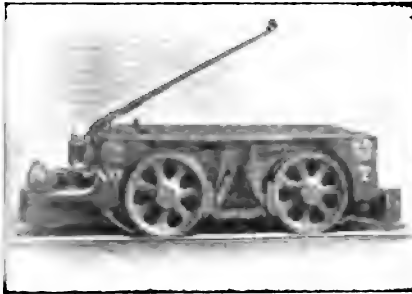
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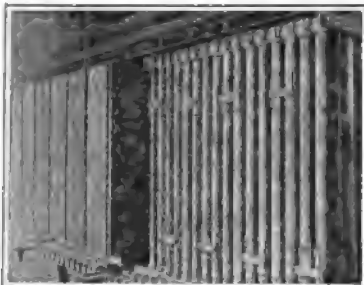
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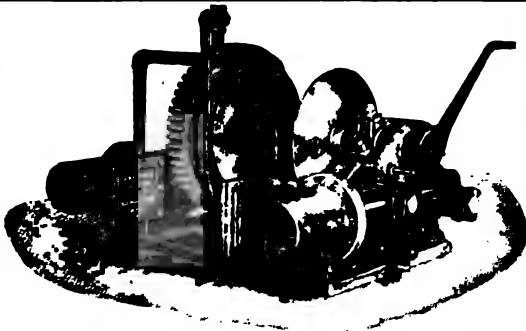


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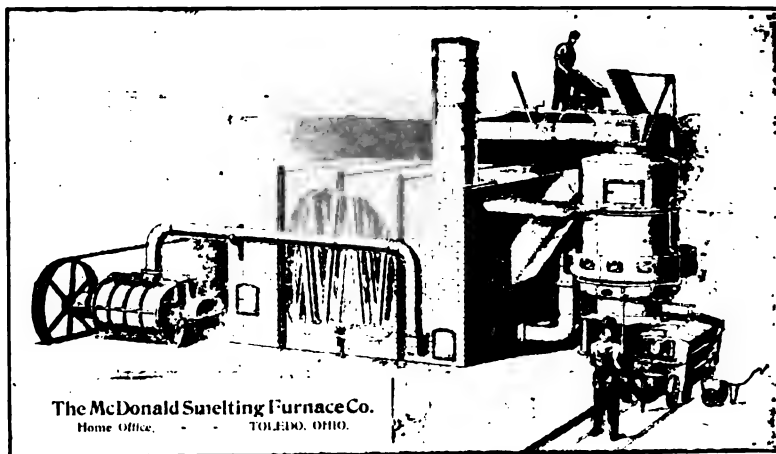
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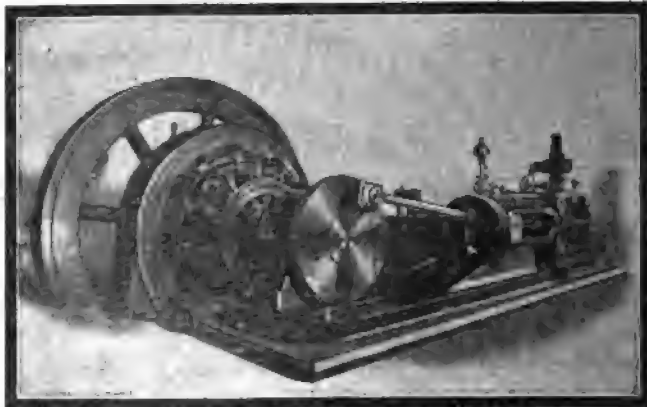
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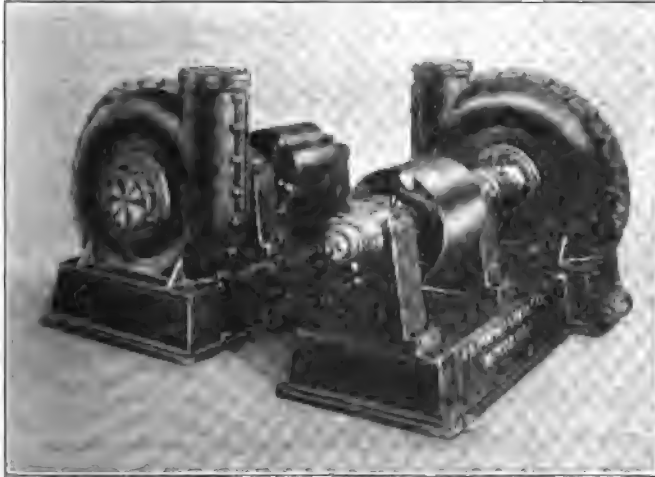
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